AURAVANA PROJECT

PROJECT FOR A COMMUNITY-TYPE SOCIETY

The Decision System

SSS-DS-003 | May 2024

SOCIETAL SPECIFICATION STANDARD

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GREETINGS

In an effort to provide the greatest possible clarity and value the Auravana Project has formatted the system for the proposed society (of the type, 'community') **into a series of standard publications. Each standard is both a component of the total, unified system, as well as intended to be a basis for deep reflective consideration of one's own community, or lack thereof. These formal standards are "living" in that they are continually edited and updated as new information becomes available; the society is not ever established, its design and situational operation exists in an emergent state, for it evolves, as we evolve, necessarily for our survival and flourishing.**

Together, the standards represent a replicable, scalable, and comprehensively "useful" model for the design of a society where all individual human requirements are mutually and optimally fulfilled.

The information contained within these standards represent a potential solution to the issues universally plaguing humankind, and could possibly bring about one of the greatest revolutions in living and learning in our modern time. Change on the scale that is needed can only be realized when people see and experience a better way. The purpose of the Auravana Project is to design, to create, and to sustain a more fulfilling life experience for everyone, by facilitating the realization of a better way of living.

Cooperation and learning are an integral part of what it means to be a conscious individual human. A community-type societal environment has been designed to nurture and support the understanding and experience of this valuable orientation.

The design for a community-type society provides an entirely different way of looking at the nature of life, learning, work, and human interaction. These societal standards seek to maintain an essential alignment with humankind's evolving understandings of itself, combining the world of which humans are a regenerative part, with, the optimal that can be realized for all of humanity, given what is known.

The general vision for this form of society is an urgent one considering the myriad of perceptible global societal crises. Together, we can create the next generation of regenerative and fulfilling living environments. Together, we can create a global societal-level community.

THE UNIFIED SOCIETAL SYSTEM: DECISION SPECIFICATION STANDARD

This publication is one of six representing the proposed standard operation of a type of society given the category name, 'community' (a community-type society). This document is a specification standard for a decision system.

Every society is composed of a set of core systems. Different types of societies have different internal compositions of these systems. The composition of these systems determines the type of society. The type of society described by the Auravana Project societal standard is a, community-type society. The standard is a composition of sub-system standards. The Auravana societal standard may be used to construct and duplicate community at the global level.

For any given society, there are four primary societal sub-systems. Each of these sub-systems can be specified and standardized (described and explained); each sub-system is a standard within a whole societal specification standard. The first four primary standards of the six total standards are: a Social System; a Decision System; a Material System; and a Lifestyle System. Each standard is given the name of its information system. The fifth publication is a Project Plan, and the sixth is an Overview of the whole societal system. Together, these standards are used to classify information about society, identify current and potential configurations, and operate an actual configuration. Because of the size of some of these standards, they may be split into two or more publications.

Essential figures and tables related to this standard exist beyond what is shown in this document.

Figures and tables on the website are named according to their placement in the standard.

- Those figures that could not be accommodated here are readily accessible in their full size, and if applicable, in color, on the Auravana Project's website [auravana.org/standards/figures].
- Those tables that are too large to include in this document are referenced with each standard on the Auravana Project's website [auravana.org/standards].

Articles

Article Section Headings

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List of figures

This is the list of figures within this document.
There are more figures associated with this standard than are identified in this document; those figures that could not fit are freely available through auravana.org, in full size, and if applicable, color.

List of tables

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Document Revision History

A.k.a., Version history, change log.

This document is updated as new information becomes available.
The following information is used to control and track modifications (transformations, changes) to this document.

VERSION	REVISION DATE	SUMMARY (DESCRIPTION)
003	May 2024	The structure of this document has changed significantly; significant changes have been made throughout this document. This document is now organized around the decision protocol, with an introduction to decisioning, decisioning in community, and the elements of a community-orienting parallel decision inquiry process (separated by article). Citations have been improved throughout and are now at APA 7th generation.

GENERATION ON	NAME	CONTACT DETAIL
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The Decision Service System Overview

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Keywords: societal decisioning, societal decision system, decision system, socio-technical decisioning, issue resolution, statistical service support, intelligence services, distributive justice operation plan, governance system, economic system, socio-economic decisioning

Abstract

This publication is the Decision System for a community-type society. A decision system describes the formal structuring of decisions involving a comprehensive information system that resolves into a modification to the state-dynamic of the material environment. A decision system is a collection of information-processing components -- often involving humans and automation (e.g., computing) -- that interact toward a common set of objectives. This decision system is designed to coordinate and control the flow of resources for global accessibility to all goods and services. To navigate in common, humanity must also decide in common. Herein, individuals maintain a relationship to resources that focuses on access rather than possession, maximizing the advantages of sharing, and incentivizing cooperative, rather than competitive, interest. All requirements relevant to human fulfillment and ecological well-being are factored in to the allocation of resources, optimizing quality-of-life for all, while ensuring the persistence of the commons. The standard decision processes produce tasks that are acted upon by an intersystem (a.k.a., interdisciplinary) team involving the coordinated planning and operation of projects. Through this comprehensive and transparent decisioning process individuals know precisely what needs to be accomplished to sustain and evolve their fulfillment. Herein, through formalized decisioning and cooperation humanity may continuously restructure society toward a higher potential dynamic of life experience for all. The use of a common social approach and data set allows for the resolution of societal level decisions through common protocols and procedural algorithms, openly optimized by contributing users for aligning humanity with its stated values and requirements. The direction of a decision system is determined by the creation and execution of directional project sub-lists: needs, objectives, requirements, etc..

Graphical Abstract

Image Not Yet Associated

1 A decision

A.k.a., A decision event, a decision context, a decision solution, a decision directive.

A decision is a conceptual space within which one of two or more feasible alternatives is selected; denoting a process of "deciding". Typically, an alternative is selected based upon it having (1) the highest probability of success or effectiveness or (2) best matching with a particular vector/directional factor(s), such as a goal, objective, or value. A decision can resolve into a determined course of action [an action], a preference, or an assumption. The space that a decision holds (i.e., the decision domain) ends once a selection of the alternative options occurs and is chosen. A decision is created and a "decision space" opens when an answer to a particular problem, issue or question is sought; all decisions requires a question, an issue. However, some decisions do not involve a problem. In other words, all problems involve a decision, but not all decisions involve a problem. For example, deciding whether to prefer to eat dark chocolate or milk chocolate is not, in and of itself, a problem frame; but, it is a decision. Deciding how many dark chocolate bars to milk chocolate bars to manufacture does represent a problem frame. Decisioning is a means of controlling the influence of an outcome; all decisions (solutions) result in directives (inclusive of action-based directives and/or inaction-based directives).

A decision is a [conscious-intentional-will] determination of one option (outcome) as being optimal for some reason. For intelligent life forms, this generally comes after a space of thought [decision space visual resolution] (i.e., cost/benefit analysis, key performance assessment, etc.), which relies upon some previous experience, knowledge and/or critical exposure. Some action must be taken towards realizing the choice being taken -- a decision is: made, selected, arrived at, etc. The objective determination of a choice being taken is reliant upon some observable difference relative to the pre-choice state. The only evidence of a choice is some subsequent action, which can be observed as a "will" to action (to act one's body in a particular way in the material environment).

All decisions are decided upon within a 'decision environment' (or 'decision space'), which is defined as the collection of information, alternatives, tools, and deciding factors (e.g., goals and values) available at the time of the decision. The decision environment is bounded by these elements. And, when these bounds are "resolved" through a clarification of the information, then the decision space "resolves". Therein, values and approaches (a.k.a., strategies) orient decisioning (i.e., are part of the construction of a decision environment).

Decisions within an environment determine the potentials available to the deciding entity. An ideal decision environment would include all possible information relevant to the decision, all of it accurate, and every possible alternative. Hence, the information-gathering function of the decision process is of great importance. Because decisions involve a bounded environment, it may be stated that the major challenge in deciding is that of probability, and a major goal of the deciding entity is to reduce uncertainty by gathering more accurate information. The process of deciding generally involves sufficiently reducing uncertainty (or doubt) about alternatives to allow for the selection of the most reasonable, rational, and valued alternative based on the information available. However, for most decisions uncertainty is reduced rather than eliminated. Very few decisions are made with absolute certainty because complete knowledge about the entire universe of alternatives is seldom possible. If there is no uncertainty, then all information leading to the optimal decision must already be present.

The concept of a decision allows for the selection of an option based upon both subjective and objective means. Objective decisions apply a set of objective tools (e.g., criteria, model, process, or strategy) for structuring and analyzing a decision. Subjective decisions often involves the contextual emotional state of the decider and may be based on incomplete or inaccurate information, or cultural and personal biases/opinions. Objective decisions may also, though not necessarily by intention, be based on incomplete or inaccurate information.

The act of deciding can be characterized in two distinct ways: (1) arriving at a decision [possibly involving an objective process] or (2) making a determination while discarding all other options by choosing through a contextually subjective or biased emotional state. Notice the two italicized words, "making" and "arriving". These words establish different orientational perspectives toward the decision process.

Every decision is process, with an:

1. **Event**, within a
   A. **external issue and internal resolution context**, resulting in a
      1. **solution design and solution selection** (Read: decision choice), resulting in a
         i. **directive** (a.k.a., direction, decision directive), resulting in
            1. **expectation** of action or in-action.

A decision process may result in one of the following outcomes:

1. Terminate in a selection of one of an available set of choices.
2. Fail to terminate in the selection of one of the available choices, and terminate its continued active status (Read: close).
3. Fail to terminate its continued active status, and go on continuously using resources.

There are a set of basic types of decisions, there are:

1. One time decisions (not real-world).
2. Repeated cyclical decisions with inertia (as in recurrent decisions, habits).
3. Complex of decisions (with multiple variables and a sequence of choices; real-world).
4. Pre-determined decisions (as in, procedures, protocols, and algorithms/programs).

> **NOTE:** *It is through our choices that we grow, and if we are ignorant of the context how can we grow.*

In order to optimally take any decision a set of axiomatic tasks must be completed (note that each of these task represents a series of sequential decisions over time):

1. **Identify the decision [problem]** for which a choice must be taken.
2. **Collect information** in order to visualize, understand, and take/make an informed analysis.
3. **Analyse the collected information** in order to actually visualize, understand, and take an optimal decision.
4. **Take a decision** (i.e., make a selection, make a choice, take a choice, select or not a solution) from the available set of solutions/choices.

When humans take decisions, their brains go through a six-stage cycle to allow them to process and react. The decisioning cycle is as follows:

1. Baseline state (baseline conditions state).
2. Novel stimuli (starting the process; issue-status and problem-state).
3. Problem-solving analysis - decision inquiry and

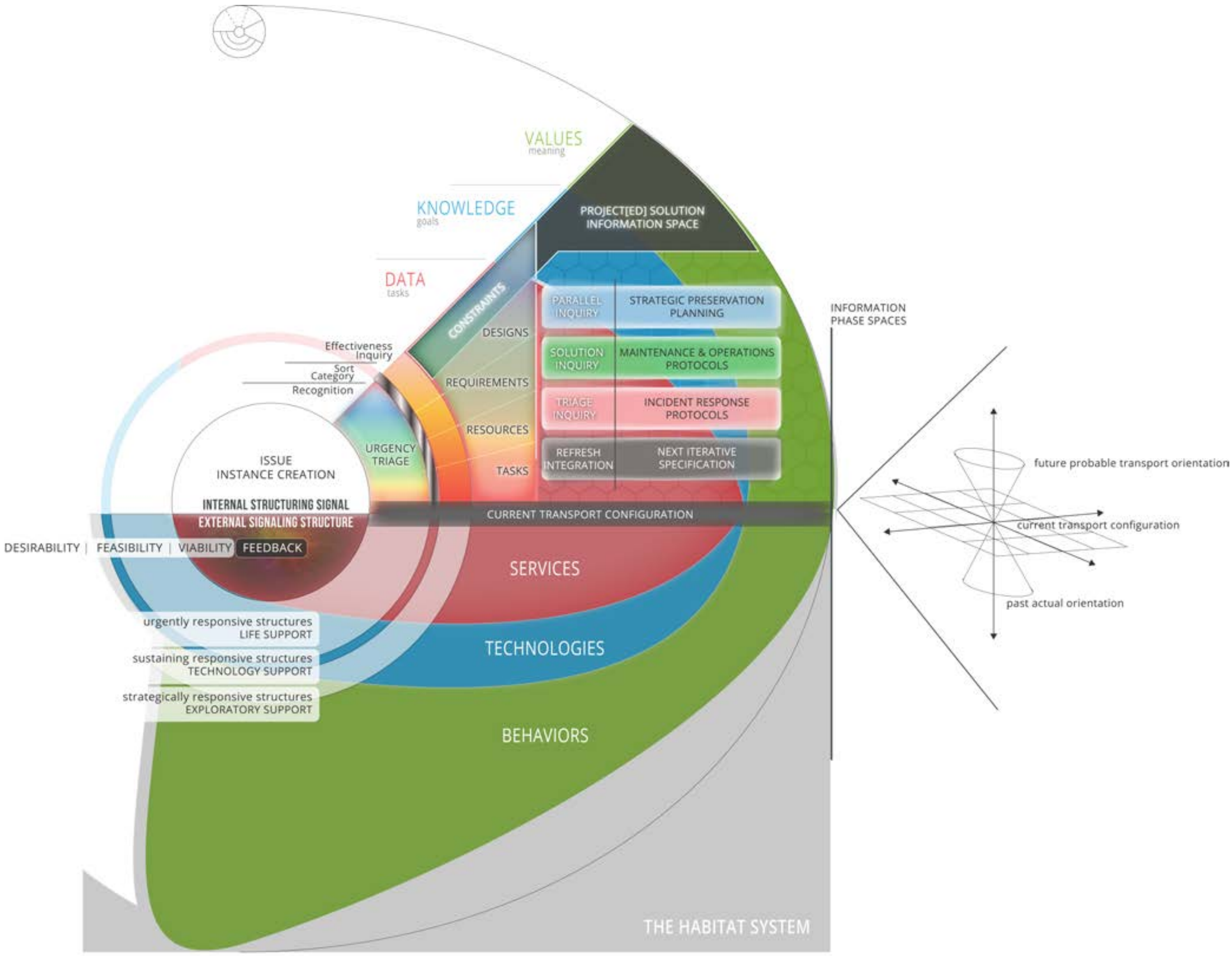

Figure 1. *This is the Real World Decision Resolution model, which shows decisioning elements in the real-world community model that lead to services, technologies, and behaviors that meet human fulfillment requirements.*

resolution produces some quantity and quality of decision option selections. Quantity and quality in relation to that which the user (with the issue) needs (and prefers) in order to have [human] fulfillment.
4. Pre-action readiness - contribution, training, and solution initialization.
5. Action - interface and reconstruct with an environment, so that it more greatly aligns with the objective of the decision that was taken about some issue.
6. Post-action evaluation (and back to Baseline) - how well did the decision lead to global human need fulfillment (and preference).

This decisioning procedure is common to human neurology, and can be operationalized to facilitate decisioning for a whole population.

> **INSIGHT:** *Access to more accurate information provides the opportunity, the probable possibility of moving into a different perspective.*

1.1 Contextualizing a decision via an overview of possible decision scenarios

> **INSIGHT:** *Everyone takes decisions all the time throughout life.*

The following are the primary axiomatic categories of decision an entity can take at the societal-level:

1. A human [self] takes a decision:
   A. A user takes a decision.
      1. A family is a mixture and dynamic of close and loving individuals, which typically involves individuals in different phases of their life.
      2. A user in education phase [of life].
      3. A user in leisure phase [of life].
      4. A contributor takes a decision (a user in contribution phase) [of life].
2. A decision [for a human self] is taken by "proxy" (i.e., by representation based on pre-specified agreement):
   A. The proxy can be proxy through agreement over,
      1. a specific educated area of expertise, for certification.
      2. a specific political election to authority, for command over force.
      3. a pre-designed programmatic solution (e.g., procedure, software application), for co-creation of the next version of community, its information system and its local habitat, regional habitat and a global habitat service system.
      4. the availability, trustworthiness and overall efficiency of [artificial] intelligence (i.e., because AI is available, trusted, and can do it most efficiently).

There are several types of scenarios in which decisions are taken [in the context of decision theory] by one or more deciding entities:

> **NOTE:** *More than one scenarios/situations can be present at the same time.*

1. **Simultaneous choice (a.k.a., obscured simultaneous choice, hidden concurrent choice, etc.):** In this scenario, different unique decision-takers select choices at the same time without knowing the choices of others. Note here that game theory often deals with simultaneous choices, especially in situations like the Prisoner's Dilemma and other strategic interactions. In any competitive game there is [likely to exist] the obfuscation/secreting of choice, in order to acquire and/or maintain competitive advantage.
2. **Sequential decisioning (a.ka., sequential decision making, sequential choosing, sequential games, etc.):** sequential decisioning has two different sub-definitions:
   A. Sequential decisioning refers to a scenario where deciders take choices in a specific order, taking into account the actions and decisions of previous deciders.
      1. Decision scenarios with feedback: In some decision processes, feedback informed (and analyzed) from earlier choices can influence subsequent decisions. Adaptive control systems and learning algorithms often deal with such scenarios.
   B. Sequential decisioning also refers to a situation where the deciders takes/makes successive observations of a process, and analyzes the observations, before a final decision is taken. The essential decision in a situation with sequential choice is not which alternative to choose, but when to stop acquiring additional information and commit to the leading alternative. In most sequential decision problems there is an implicit or explicit resource usage/cost associated with each observation. The procedure to decide when to stop taking observations and when to continue is called the 'stopping rule.' The objective in sequential decision making is to find a stopping rule that optimizes the decision in terms of minimizing losses or maximizing gains, including

observation costs. The optimal stopping rule is also called optimal strategy and optimal policy (Saad et al., 1996).

3. **Single-stage decisions:** These are one-time, isolated decisions where there is no subsequent decisioning (for some extended duration of time). For example, deciding whether to buy a product (in the market), choose a career (in the market). Note: there are no single stage decisions at the societal-level of decisioning.
4. **Multi-stage decisions (a.k.a., progressive decisions):** Unlike single-stage decisions, multi-stage decisions involve a series of interrelated choices. These decisions often involve a sequence of actions and typically occur in a specific order, similar to sequential choice scenarios. Examples include project planning, supply chain management, and investment strategies.
5. **Uncertainty and sequential action decisioning (a.k.a., markov decision processes (MDPs)):** In In this scenario, deciders identify a series of states, actions, and transitions between states. Each action affects the probability of transitioning to a future state and accumulates benefits/rewards or harm/costs. Uncertainty and sequential action scenarios are resolved in large part through decision modeling and a well-defined mathematical framework. The active processes during these types of decisions are commonly used in fields like reinforcement learning, robotics, and optimization.
    A. **Uncertainty and control problems (a.k.a., stochastic control problems)**: A scenario that involves making decisions under uncertainty and the control of stochastic processes (Read: randomly evolving processes). In the real-world, all societal decisions are taken under a scenario where there are risks and degrees of contextual and knowledge uncertainty.
    B. **Reinforcement learning (RL)** : A scenario that involves processes where agents take decisions to maximize cumulative benefit/reward. Reinforcement learning is the method of developing machine intelligence (a.k.a., artificial intelligence, AI). Here, the question is, what signal, and beneficial evolutionary behaviors, are being reinforced? Common reward in community are utility and efficiency. The common reward in the market is money. The common Reward in the State is authority/power-over-others.
6. **Dynamic programming**: A scenario that involves dynamic programming refers to a set of software programming techniques to solve and optimize a decision process over time, using the following data sets:
    A. **Subproblem decomposition:** Decompose a complex decision problem into a sequence of smaller sub-problems, which generally correspond to decisions about a sequence of actions and states.
    B. **Optimal substructure:** The "optimal substructure," refers to the optimal solution to the problem, constructed from the optimal solutions of its subproblems.
    C. **Storing accessing:** All decisioning requires the storing and reusing of solutions to subproblems to avoid redundant calculations.
        1. **Memoization:** When a subproblem is solved, its solution is cached in a data structure, such as a dictionary or a memoization table. The solution is stored with an associated key that represents the input to the subproblem.
            i. **Recursion:** is breaking a problem into sub-problems and solving the sub-problem as part of the total/integrated solution.

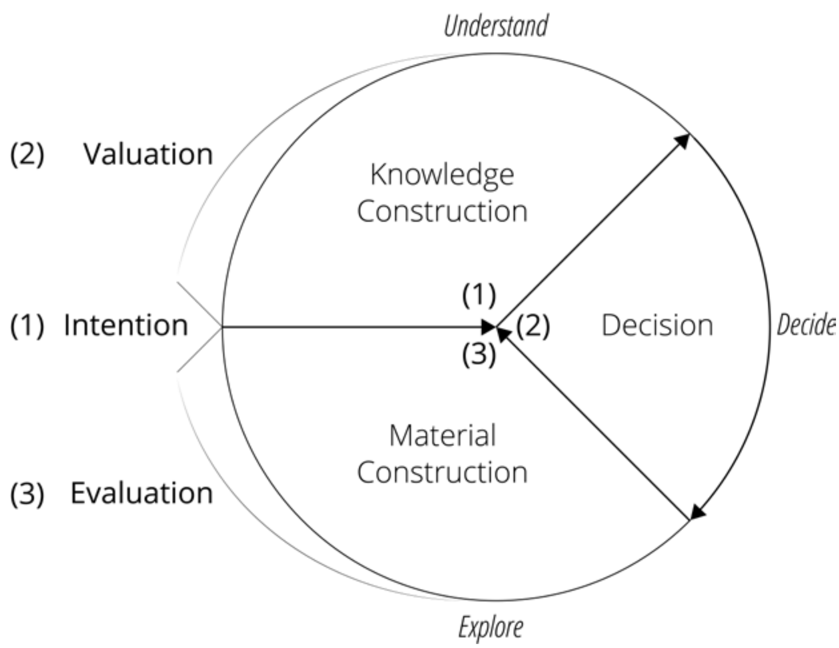

Figure 2. *Deciding new material resolution through intentional evaluation of old material construction.*

It starts with the original problem and breaks it down into sub-problems, which are solved recursively. In a recursive system, which are combined:

1. **Base case:** the base case represents the simplest form of the problem, which can be solved directly without further recursion. It serves as the termination condition for the recursion. Without a base case, the recursion would continue indefinitely, leading to a stack overflow or infinite loop.
2. **Recursive case:** The recursive case represents the part of the problem that can be divided into smaller subproblems. The recursive function calls itself with a modified version of the problem (a smaller instance of the same problem) until the base case is reached.
3. **Combining solutions:** Once the base case is reached, the recursion "unwinds" (a.k.a., recursion unwinding, recursion stack unwinding, or recursion termination) as the solutions to the subproblems are combined to form the solution to the original problem. The solutions to the subproblems are typically combined using a predefined logic or formula.
Recursive functions call themselves to solve subproblems. A recursive function has a stack. Each recursive call adds a new level to the call stack, which can lead to stack overflow errors if the recursion goes on too long.

2. **Tabulation:** When a solution is solved for a sub-problem, the system creates a table or array (often called a tabulation table, DP table, etc.) to store the solution for the sub-problem. The table is filled in a systematic way, starting with the simplest subproblems and using their solutions to build solutions to more complex subproblems. Tabulation uses a table or array to store intermediate results. There is no risk of stack overflow, making it more memory-efficient.
3. **Retrieval:** Before solving a subproblem, the algorithm checks whether a solution

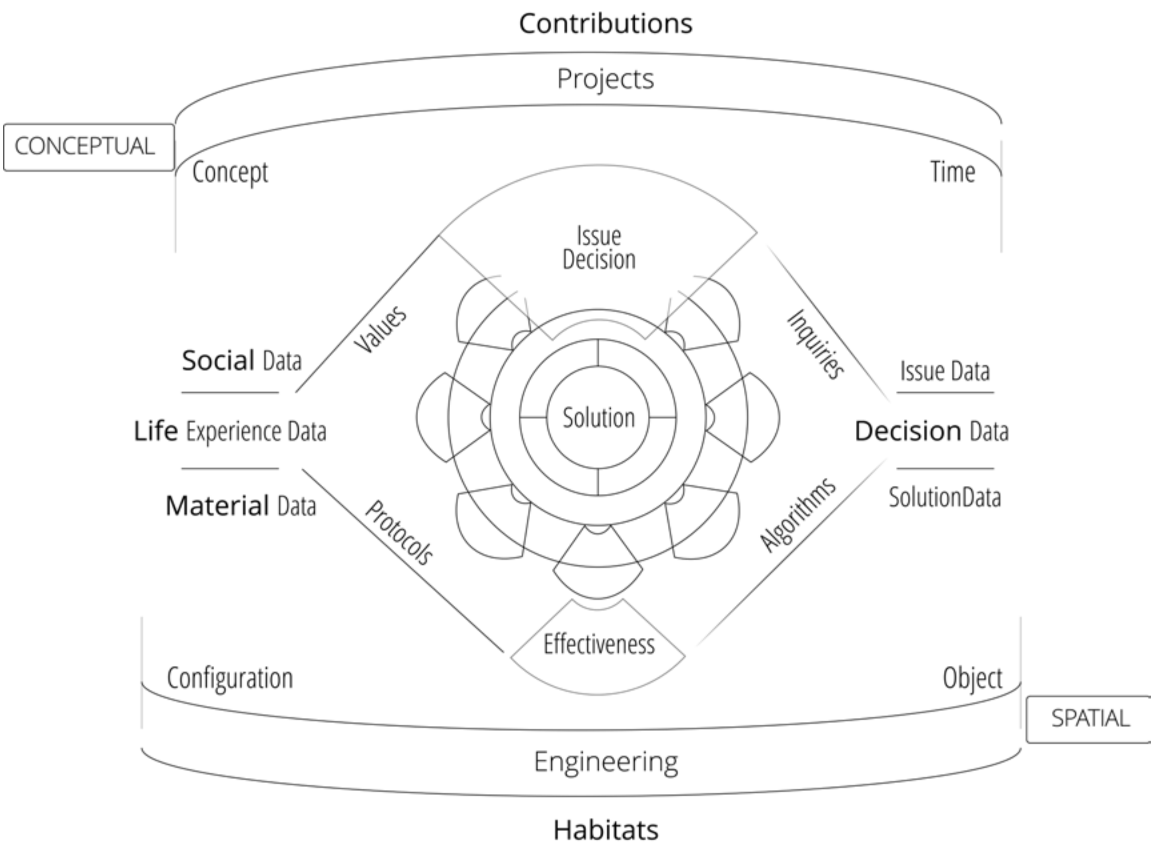

Figure 3. *Conceptual and spatial resolution of a common solution to optimal, mutual human life experience by means of resolving issues through contribution and project-engineering of the habitat and larger societal system.*

for that specific subproblem already exists in the cache. If it does, the cached solution is returned instead of recomputing it. It is typically implemented using a recursive algorithm, where the function or algorithm makes calls to itself.

7. **Optimization decisions:** The goal of dynamic programming is to optimize a particular objective function. Typically, the objective of any decision [at a societal level] is often to maximize expected cumulative benefits (as in, rewards) for humanity and to minimize harms/costs over time by finding the optimal solution iteratively.
   A. **Temporal aspect:** "Over time" refers to the sequential nature of the decision process. Decisions are taken along a number line (Read:

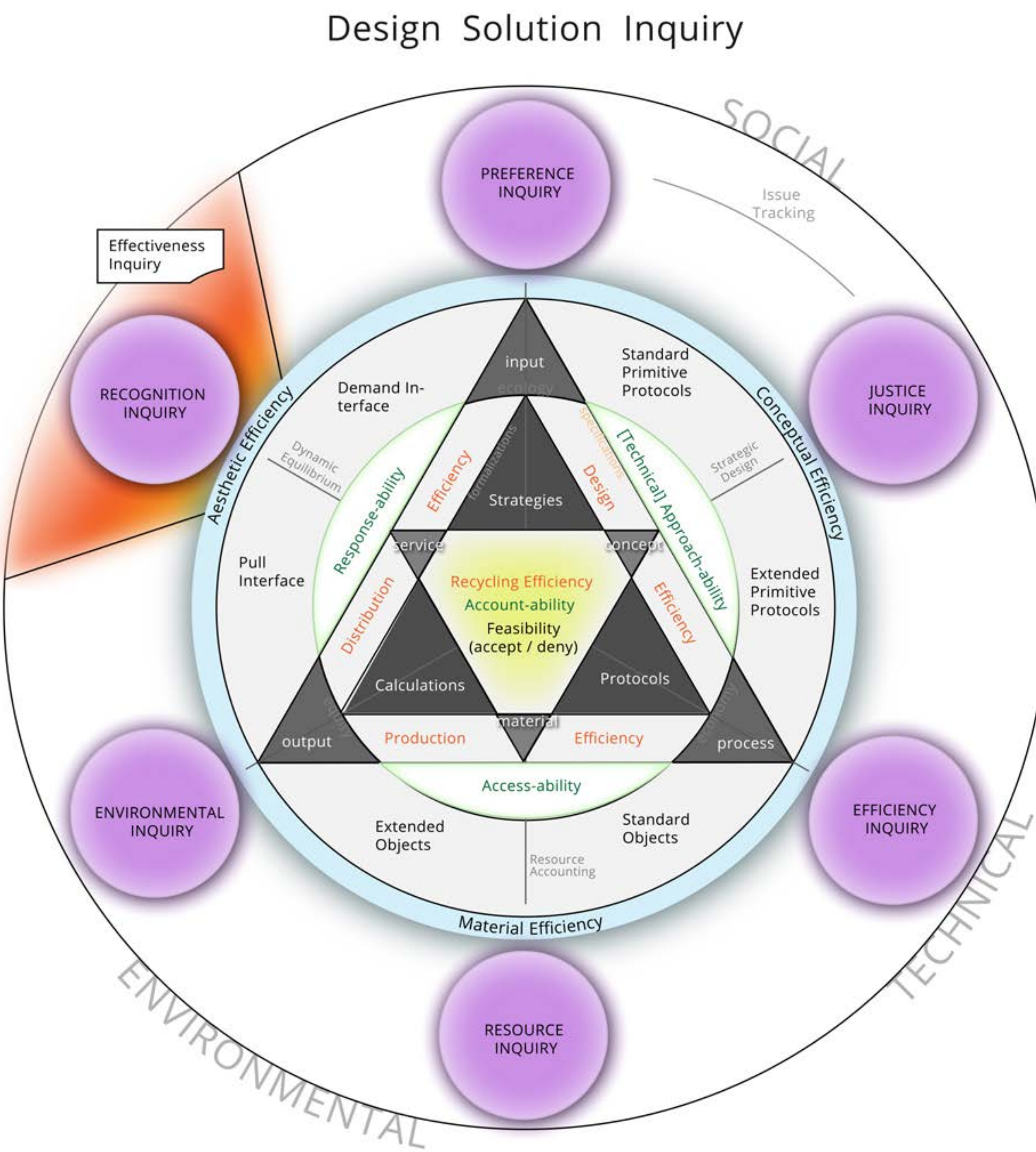

Figure 4. *The Decision System high-level inquiry-view of the global decision protocol. Design solution inquiry model - availability to everyone on an equal basis.*

sequencing of numbers, as events/points along a "time"line).

B. **Deterministics (a.k.a., linear algebra, linear programming, deterministic mathematics):** Linear algebra is used to model and solve linear programming problems. Decision variables and constraints can be represented in matrix form, and optimization techniques, such as the simplex method, involve matrix operations. Linear algebra is the mathematics of vectors and matrices. Network flow problems involve the efficient allocation of resources, wherein matrices are used to represent flow, costs, and capacities. Matrix manipulations are used to find optimal flow solutions. Matrices are used to represent the flow of goods and services in supply chain and logistics problems, with matrix algebra helping optimize routes and schedules. Here, given a set of inputs, there is only one correct answer to a linear algebra problem. All algebraic sourced information (i.e., algebra, geometry, trigonometry, calculus) has a certain [correct] answer. In algebra, every variable has a certain value, whether it is known or not. All algebraic math problem-solutions are programs.

1. **Linear algebra matrices:** The linear algebra matrix represents linear transformations and enables the performing of algebraic operations on vectors and scalars. Linear algebra matrices are used in various fields to represent transformations, solve systems of linear equations, find eigenvalues and eigenvectors, perform matrix multiplication, and more. Linear algebra matrices do not necessarily represent statistical relationships or covariances between variables. They can represent a wide range of mathematical operations and transformations, depending on the context. Linear algebra matrices are commonly orthonormal. Orthonormal matrices are used to represent orthonormal bases and orthogonal transformations, and their rows (or columns) are orthonormal vectors with a magnitude of 1. To be orthonomal, a matrix must be both orthogonal (in that two vectors are perpendicular to one another and dot product is zero) and normal (the vector has a unit length of 1 whole unit).

C. **Probabalistics (a.k.a., statistics, statistical programming, probabilistic mathematics, stochastic mathematics, randomness mathematics):** Statistics is the mathematics of probabilistic or stochastic systems. Statistical mathematics is used to model and solve data set pattern questions, including: mean, median, mode, spread of observations ("standard deviation") and significance (Read: "p-value"). Here, uncertainty quantified. In statistics, all variables have distributions. The values are all able to be pointed on a graph, sometimes finite, and sometimes not. Statistics is the field of study that deals with collecting, analyzing, interpreting, presenting, and organizing observed data. It includes techniques for summarizing and drawing conclusions from one or more observation input as data.

1. There are several general, overlapping, types of statistics:
   i. **Probability statistics:** summarizes and describes uncertainty and randomness.
   ii. **Descriptive statistics:** summarizes and describes data with observed measures including: means, variances, and distributions.
   iii. **Predictive (inferential) statistics:** summarizes and describes confidence of a statement after sampling a population, including hypothesis testing, confidence intervals, and regression analysis.
   iv. **Multi-variate statistics:** A technique that summarizes and describes multiple variables
2. **Principal component analysis (PCA)** - a technique that is categorized under "multivariate statistics," and is commonly used [in statistics and data analysis] for reducing the dimensionality of data. PCA accomplishes dimensionality reduction by identifying new variables, known as principal components, that are linear combinations of the original variables. Reducing dimensionality refers to the process of decreasing the number of variables or elements in a dataset while retaining the most essential information and patterns. Other dimensionality reduction techniques are: singular value decomposition (SVD), t-distributed stochastic neighbour embedding (t-SNE), etc. The principal phases of PCA capture the most important patterns and variances in the data:
   i. **Centering the data:** The first step in PCA is often to center the data by subtracting the mean of each variable from the data points. This ensures that the data is centered around the origin.
   ii. **Covariance matrix (a.k.a., matrix in statistics, variance co-variance matrix,**

co-variance matrix): PCA relies on the covariance matrix of the original data. The covariance matrix describes the relationships between pairs of variables and is a measure of how variables change together. A covariance matrix is a square matrix that represents the pairwise covariances between variables in a dataset. Each element of the matrix corresponds to the covariance between two variables. It contains variances on the diagonal and covariances off-diagonal. The covariance matrix is a square matrix where the diagonal elements represent the variances of individual variables, and the off-diagonal elements represent the covariances between pairs of variables. The diagonal elements of the covariance matrix represent the variances of individual variables, indicating how much they vary from their means. The off-diagonal elements represent the co-variances, showing how pairs of variables vary together. Covariance matrices are used in statistics to analyze relationships between variables, calculate variances, and assess how variables co-vary. The values in a covariance matrix describe the direction and strength of linear relationships between variables. A positive covariance indicates a positive linear relationship, while a negative covariance suggests a negative linear relationship. Covariance matrices are typically symmetric because the covariance between variables X and Y is the same as the covariance between Y and X. However, they are not orthonormal because their entries are not limited to values of 1, 0, or -1, which are characteristic of orthonormal matrices. To be orthonomal, a matrix must be both orthogonal (in that two vectors are perpendicular to one another and dot product is zero) and normal (the vector has a unit length of 1 whole unit). To calculate a covariance matrix, you compute the covariance between each pair of variables in your dataset. The covariance between two variables X and Y is computed as the average of the product of their deviations from their respective means:

1. $Cov(X, Y) = \Sigma [(X - \mu X) * (Y - \mu Y)] / (n - 1)$
2. Here, μX and μY are the means of X and Y, and n is the number of data points.

iii. **Eigenvalue decomposition:** PCA proceeds by performing an eigenvalue decomposition of the covariance matrix. This decomposition identifies the eigenvalues and eigenvectors of the covariance matrix. The eigenvalues represent the amount of variance explained by each principal component, while the eigenvectors correspond to the direction or linear combination of the original variables that define the principal components.

iv. **Selecting principal components:** The principal components are sorted in descending order of their associated eigenvalues. This means that the first principal component explains the most variance, the second explains the second most, and so on. Typically, you can choose a subset of the principal components that capture a sufficiently high percentage of the total variance in the data, reducing dimensionality.

v. **Data transformation:** The original data can be projected onto the selected principal components, creating a new dataset with reduced dimensionality. This transformed dataset retains the most important patterns and variance while reducing noise or redundant information.

8. **Multi-criteria decision analysis (MCDA):** Are scenarios where decisions are influenced by multiple criteria, often conflicting, and deciders must weigh (Read: value, objectives alignment) the import[ance] of each criterion in choosing an alternative over the other alternatives. Here, decision matrices are used to compare alternatives based on multiple criteria. Matrix operations, such as weighted sum or matrix multiplication, are used to calculate scores and rankings.
9. **Social constructed preference (a.k.a., social preference, individual selective agreement, social choice):** These are scenarios where multiple individuals or stakeholders take a collective and simultaneous decision (i.e., take a decision together) based upon individual selective agreement, often through a voting mechanisms or preference aggregation survey, with a pre-constructured set of possible solutions as votable, or preferences as available, for selection by the individuals.
   A. **Unity** - a specific number of people who are required to participate for the decision to be resolved. How many users must agree to a

specific choice, for the selection to be taken? How many individuals of the total population of individuals must vote for the a specific solution for the solution to be selected? How many individual users must agree to a specific choice, for the selection to be taken?

B. **Quorum** - a specific number or proportion of individuals required to be present or participate in an activity or decision process to make the decision "valid". How many individuals of the total population of individuals must vote for the vote to be counted/valid? Did enough people participate for the decision to be taken/executed?

1.2 A decision support system

A.k.a., Decision support systems (dss), expert system, and executive information systems, executive support system (ess), machine learning systems, automation systems, information coordination system.

Decision support systems can be designed and applied for every scenario in the real-world to optimize solution selection toward optimal human fulfillment and optimal ecological restoration. A decision support system supports human decisioning regardless of the scenario. Whenever there is a decision, there is a problem/issue. A problem/issue is identified and data is collected with the basic purpose of solving the problem/decision. Data is evaluated in the context of a problem-solution to determine all possible ways to resolve the problem-solution. Identify and/or generate alternative solutions with the data available. The alternatives are evaluated to identify the most suitable/appropriate solution(s), by some critical method. Every alternative is compared with every other alternative so that the evaluation is accurate and gives more clarity toward the decision. The best alternative amongst the available alternatives is selected. The best selected alternative is implemented. The results of the implementation are fed back into the decision space, which then adapts appropriately. Follow-up reviews occur continuously and/or at every stage. I there a need for a modification to the selected solution; is the solution still required; has the issue changed? A decision system is, in part, a data solution resolution evaluation system.

A decision support system functions, in an automated manner, to meet the decision requirements of the population (in concern to habitat design, construction, operation, and material cycling). The decision support system designs and decides the master plans of habitats, and becomes operationalized at the level of a community habitat network (where resources and contribution are shared) as a whole. The decision support system combines calculation with human-ecological research, socio-technical engineering, and human [need and preference] requirements input. The results of decisions are modifications to the master plans to which the habitat team personnel, as technicians, provide services to the local populations. Decisioning is an integrated and systematic process in community that transparently completes a inquiry resolution protocol, the solution to which includes a set of value-alignment problem-solutions, and statistical calculation. The protocol (including: human involvement, value processes, and calculation) produces a new master plan to the habitat, and simultaneously, the whole habitat network. By societal engineering in this contributorily planned and projected way, it is possible to optimize human community values of freedom (openness), justice (fairness), and efficiency (of duty and of inclusivity). In effect, part of the goal is to engineering and facilitating the development of integrated and resilient habitat that power and feed the fulfillment needs of a community of families around the world. Using AI to optimize and coordinate, and sometimes, to act (as in, robotification).

A decision support system is an information system application that assists decisioning, from minor assistant e to possible full automation of decision. The informational and material elements of a decision support system include:

1. **Hardware** - materials composed to function as part of an information system.
2. **Database** - collection of current or past data.
3. **Model base** - logic and organizing rules; selection of analytical and mathematical models that can be made accessible to the decision system.
   A. **Physical model** - model of machine.
   B. **Mathematical model** - equation, formula.
   C. **Verbal model** - description of a procedure for doing work.
4. **Software (computer programs)** - applied computational language for use as interfaceable and functional application. Computer programs are applied through a programming language; computer programs are also known as software.
5. **Compiler (interpreter)** - translates programming language statements into machine language.

In this sense, it could be said that a decision system processes data to convert it into information (intelligence, etc.). A decision support system processes information to support the decisioning process of a control or coordinating element. Decision support systems may help a decisioning entity use data, documents, knowledge, and/or models to successfully complete decision process tasks. A decision system must necessarily have the ability to "execute" function/order/etc., at the decision [time] event and to change to the structure/behavior of the next version of the system(s) operation.

Executive functioning is a kind of intelligence, a kind of ability to work out a way of solving a problem and then persisting and controlling "yourself" to actually and intelligently solve>decide the problem in the way that "you" worked out [a solution] to solve it. This is how "you" create solutions. Studies find that children who have more opportunity for self-directed play are better at "executive" functioning tasks than children with less opportunity to play. Similar studies show that children with more play are better able to control their emotions in emotion provoking situations. Essentially, what all the studies show is that hose children who have more opportunity for real play perform better on all of these kinds of assessments than children who don't have such opportunities. (Gray, 2023)

The purpose of a collaborative support system is to give people the tools to design information and material flows together. The purpose of a decision support system is to give people the tools to select the optimal informational and material compositions give all prior and probable input. A decision support system is a structured approach to decisions, which may be structured, semi-structured, or un-structured.

Project coordination (management system information) is the integration of the information sets of people, technology, procedures, resources, and time...for mutually beneficial work, for collaboration. This integration data is useful, but not sufficient in solving societal issue/problems. There is information system coordination and material system coordination (logistics). An information system is a planned system of collecting, storing, processing, and disseminating/ sharing data in the form of information. A material system is a planned system of collecting, storing, processing, and disseminating information in the form of material surfaces. Informational and material systems carry out the functions of society. A coordination information system is a group of information coordination methods tied to the automation, or support, of human decisioning. Note: In the market-State, management is getting things done through or with the people in the organization. In community, coordination is most appropriate (in place of management), because it does not carry with it the idea of extrinsic motivation. Whereas, collaborators coordinate because everyone is intrinsically motivated, managers “incentivize” with extrinsic motivation (i.e., with rewards punishment; coercion).

The basic functions performed by a coordinator are:

1. Planning decisions, tasks, and information and material flows.
2. Controlling and information flows
3. Staffing tasks
4. Organizing information and material flows.
5. Directing information and material flows

Coordination decision models include:

1. Optimization models - provide guidance for action by generating optimal solutions consistent with a series of constraints.
2. Forecasting models - provide guidance on resource supply, service demand, and probable action.

A system is a set of elements joined together to achieve a common objective; such as the joining together of all elements that form society to meet our mutual need for global access to well-being and all that humanity and the biosphere have to offer. Every system is composed of subsystems. In this model of society there are four core societal sub systems, the publications, and then the conceptual model itself into which those specifications fit in a spiral, and highly varied, manner. Systems have inputs that are processed through a transformation process that converts these inputs to outputs. The outputs of a useful societal system are beneficial services, service objects, and conditions, as specified by needs, objectives, and requirements.

Information systems may communicate information [via channels] transparently, or not. In the market-State, transparent information systems are called open source systems, named so because their code, construction and operation are open to inspection, understanding, and duplicable use.

Information generated by an information system may be for planning and control of operations, and other problem solving. Information system coordination involves processing in support of a wide range of possible organizational functions and operational processes. Information system coordination is capable of providing analysis, planning, and decision support.

A sufficiently information system must have at least the following subsystems, including not limited to,

1. Sensory, storage, and computation/processing systems.
2. Query systems.
3. Analysis systems.
4. Modeling systems.
5. Decision support systems.

Note that knowledge-based systems use knowledge about a specific application areas to facilitate decisioning.

> **INSIGHT:** *Decisions involve the nearly ubiquitous system’s process of: input > process > output.*

1.3 A decision space

> *A.k.a., A problem space, deciding, an issue space, a solution space, a options selection space, an action space, possibilities space.*

A "decision space" opens when a decision question is asked or a problem is presented, and it enables the resolution to a decision question. A decision space includes available choices, some of which are optimal choices and others of which are poor choices [for any given purpose]. Most decisions in social, economic, and engineering environments involve some form of a conceptual or technical problem. A decision space may also be called an 'action space' if the decision must resolve into action (or non-action). An action is something that influences an environment. A basic decision space consists of a set of *decision variables* that have a relationship with a set of *decision alternatives* being evaluated in a *decision process (or through a decision mechanism)*.

The term 'decision space' includes the word "space", which implies the existence of objects and events in an active and interrelated area where something occurs. A decision space is a place where events occur to objects and information maintains a flow [until the space is resolved]. With this consideration in mind, there are several commonly used definitions for a decision space that are semantically inaccurate. For example, the term 'decision space' is sometimes referred to as "the range or list of available alternatives". Since these "alternatives" are simply objects and do not represent activity or events they cannot by themselves be a decision space. Instead, they are information in a decision space, and are not the decision space itself. The only context in which this truncated definition for the term decision space makes rational sense is when someone is "making a choice" between potential outputs without the actual act of processing any inputs. As was noted earlier, this often happens when personal bias, opinion, or emotion, "make the choice".

Further, it is semantically imprecise if not inaccurate to use terms like "input decision space" and "output decision space". Neither input nor output represent a process; instead, they represent a one-way flow of information -- they represent objects excluding events. The same logic also renders inaccurate the definition of a decision space as "the inputs and outputs of a decision". Again, these elements are information in a decision space, but are not the decision space itself.

Decision spaces exist in the context of other decision spaces. The typical metaphor used to explain this is that of a stream. There are a stream of decisions surrounding any given decision; many earlier decisions have led up to this decision and made it both possible and limited. Many other decisions will follow from any given decision. Another way to describe this situation is to say that most decisions involve selecting from a group of previously known alternatives, made available from the universe of alternatives by the previous decisions. Previous decisions have "activated" or "made operable" certain alternatives and "deactivated" or "made inoperable" others. It might be said, then, that every decision space: (1) follows from previous decisions, (2) enables many future decisions, and (3) prevents other future decisions. When computers arrive at decisions within the context of other decisions the process is known as 'stream computing'. Data stream computing enables real-time analysis (or liquid analytics) of incoming information.

The very idea that a decision space exists in the context of other decision spaces leads to the inclusion of the idea of probability. In a decision space probabilistic information entropy models (i.e., patterned fractals) may be used to represent the uncertainty associated with the relevant information elements needed to resolve the decision. Understanding change is more than a linear projection, it appears as a probability patterned continuum. When a decision is taken and resolution of the decision space leads to an action, then the action will modify future probabilities [that will either help us all grow and develop, or not grow and create suffering, based on our decisions].

Some possibilities are more probable because of the decisions that have come before and the information already in the decision. In other words, past decision spaces affect the probability of future decision spaces. The future isn't set in stone; it is probable and it depends on the choices we make as individuals in society. The designs and concepts that we choose do in fact matter.

The decision space of a living organism represents its latitude to exercise free will. Therein, the information in a decision space reflects the awareness level and pattern recognition ability of the deciding entity.

When life is viewed as patterns of resonance then a spectrum of more capable relationships appears, all of which connect on a larger scale that allows for shared community/communities (of mind). A truly civilized kind of identity, although it poses new challenges. A more complex universe is within you, so you must learn to accord within a more complex universe. Evolution is in every term of the equation; it's always part of our makeup.

As individuals and society grow [in awareness and knowledge and consciousness] and lower their entropy, their decision space (by consequences) becomes larger, and therein, they can see the world from a wider perspective (i.e., one of greater integration and unification). When someone perceives the world from a wider perspective there is more of a realization that any given problem can be approached from many different angles. And possibly therein, individuals may come to see that that which was thought a/the problem is not actually a/the problem, or is just a symptom of a larger root problem. Herein, humanity may come to realize that its level of freedom depends highly on its level of awareness (or consciousness). The more conscious individuals are of themselves and their environment, the more information (i.e., data, and knowledge) they have available to their awareness to develop an optimally structured decision space. Some societies restrict awareness artificially in order to subjectively influence and control the decision space of their members. There are environmental conditions that influence our ability to make "good decisions". Herein, the notion of "personal responsibility" becomes significantly more complex when the environment is accounted for. Fundamentally, there are real limits that everyone faces when it comes to making "good" decisions in a complex and dynamic environment.

NOTE: *Decisions (as solution selection tasks) are resolved via methods and means, data and analysis, sampling and searching.*

1.3.1 Decision space elements

A decision space is composed of multiple interrelated elements. The three most general components of a decision space are inputs, processes, and outputs. Herein, a decision space is a coherent environment for integrating input, process, and output via the nearly ubiquitous systems methodology. Essentially, a decision space allows for decisioning (i.e., arriving at decisions) in an explicitly defined and systematic manner. The output is the selection of a decision, the process is the structure used to organize the inputs and arrive at a decision, and the input is the collection of information to be used in the process of deciding.

In a decision space, a **decision variable** is a variable under the direct input control of the deciding entity applied toward the evaluation of the decision alternatives. For example, if the decision involved the purchase of a car, then some of the relevant variables of this decision might include purchase price and budget, gas mileage, driven terrain, comfort, environmental considerations and other variables relevant to purchase of an automobile. Decision variables include: (1) the attributes (and to a lesser extent objectives) used for evaluating the alternatives; and (2) the decision mechanism used in the evaluation, analysis or algorithmic process. There also exists a set of uncontrollable variables known as external constraints.

The generic usage of the term **criterion** denotes the concepts of "attribute" and "objective". In the decision space, a criteria is the clarified meaning of a decisions objective(s) and the characteristics (or attributes, attributed requirements) that each alternative must possess to a greater or lesser extent. The set of criteria in a decision should reflect all concerns relevant to the decision question or problem, and include measures for satisfying the objectives of the deciding entity. Such measures are called **attributes (or metrics)**, which are derived from the decision's objectives. Please note that some people use the words attribute and criterion synonymously and other people use the word attribute to refer to a measurable criterion [as is the case herein].

A **decision objective** is a variable detailing the decisions intended resulting effects. Ultimate objectives (or 'terminal objectives') are usually framed in terms of their value orientation, such as economic sustainability, resource usage efficiency, and social cooperation. These are the high-level resulting effects desired from a decisions output. In a community the objective criteria are the community's orientational and operational values. The concept of an objective is made functionally operational in the decision space by assigning to each objective under consideration one or more **attributes** that, directly or indirectly, measure the level of an objective's achievement in the consequential probability space.

The relationship between objectives and attributes has a hierarchical structure. At the highest level are the most general objectives (root objectives, goals, purpose(s), and values). They may then be defined in terms of more specific objectives, which themselves can be further defined at still lower levels. At the lowest level of the derivative hierarchy are attributes, which function as quantifiable indicators of the extent to which associated objectives are realized within a space generated by a decision question. Attributes and objectives are both decision variables and decision criteria. Criteria have at least five desirable properties: unambiguous; comprehensive; direct; operational; and understandable. (Keeny, 2004) Regardless of the complexity of the decision, criteria may be formulated and arranged into a priority hierarchy. Also, a criterion may implicitly or explicitly imply a constraint.

Constraints are limitations imposed by the discoverable boundaries of nature or by human beings that may preclude the selection of certain alternatives in the probability space. They represent restrictive conditions and real limitations. There are various kinds of constraints, including but not limited physical constraints (e.g., the availability of resources), value and moral constraints, logical constraints, scientific and technical, and cost constraints. **External constraints** (or environmental constraints) are uncontrollable inputs (vs. criteria, which are generally considered controllable). Constraints can be used to eliminate from consideration alternatives that are characterized by certain attributes. A "constraint map" displays the set of feasible alternatives (versus the universe of known alternatives).

Decision alternatives (options) are the list of available decision options at the disposal of the deciding entity, the "feasible set". Each alternative represents a different final decision, a different arrangement of information. For example, a clothing designer may have to decide whether to use the colors blue or green or both, which would represent a finite feasible set of three decision alternatives. Alternatives can be identified by searching for them as well as developed (created where they did not previously exist). Normally, constraints exist restricting the feasible set of alternatives to a subset of alternatives. When building a material system the constraints may originate from resource restriction, carrying capacity, and functional usage. Essentially, the application of constraints to the decision space yields an implicit definition of the feasible set of alternatives; even though the individual alternatives may not be explicitly known upon the creation of the decision spaces. From a theoretical point-of-view, there is no major difference between an explicit or implicit definition of the feasible set. However, in the latter case there is the additional problem of identifying feasible alternatives.

The **decision mechanism (decision method)** refers to the process by which the decision is resolved and an alternative selected. The decision mechanism explains *how* a decision is to be arrived at. It details the specific decision process (technique or tool) that analyses all relevant information and resolves the decision space. The decision mechanism process is frequently known as a "decision analysis". During analysis, decision rules and decision procedures are followed until a final decision is reached.

Decision analysis is a systematic approach to deciding that involves the examining and modelling of sequences or pathways of diagnosing an issue, resolving a decision, and solving a problem. A decision analysis may be expressed graphically in the form of a decision model or decision tree. Generally, decision mechanisms identify relationships between input values, and then examine those relationships in a progressively resolving context that creates an increasingly cohesive set of information, which eventually reaches a functionally useful threshold that triggers the resolution of the decision space by a selection of one of the alternatives. In other words, the purpose of a decision analysis is to select one of two or more feasible alternatives through some form of analytic tool, of which there exist a variety of options. Analytical decision support tools include, but are not limited to: decision trees; influence diagrams; algorithms (decision algorithms); statistical tests; multi-criteria decision analysis; the analytical hierarchy process; optimization analytics (directs best possible outcome); cost-benefit analysis; naturalistic decision analysis (e.g., Bayesian models); and various other analytic tools. All analytical tools provide systematic and structured guidance; however, more advanced analytic techniques may be distinguished from traditional analytic techniques by the fact that they require a supporting data management system, which to a great extent has changed the decision analysis landscape of many organizational institutions.

This economic decision system may be described (in part) as a formalized 'decision analysis' system. Ronald Howard (2015) developed the functional idea of 'decision analysis', and it is an analytical mechanism that allows for the development of as rational a decision as possible by putting all of information about a topic into a formalized calculation system. Decision analysis involves systematic reasoning about the total known system, including the fulfillment of all individuals. In a community-type society, the Real World Community Model unifies all societal information, and therein, the decision system is the formalized and explicit computational resolver of all decisions.

Influence diagrams are a conceptual modelling tool that graphically represents the causal relationships between decisions, external factors, uncertainties and outcomes. Influence diagrams are useful for modelling and visually representing the 'problem space' (or 'decision problem'). Decision tress and influence diagrams are complementary visualization tools for modelling a decision problem.

A **decision tree** is a diagrammatic representation of the possible outcomes and events used in the decision analysis. It is also a way to display an algorithm. A decision diagram is composed of nodes and branches, creating an arborization effect. The steps proceed sequentially with each step depending on the decision arrived at in the preceding step. Decision trees are produced by algorithms that identify various ways of splitting a data set into branch-like segments. These segments form an inverted decision tree that originates with a root node at the top of the tree. The information object of analysis (i.e., problem question) is reflected in this root node as a simple, one-dimensional display in the decision tree interface.

A decision tree is a useful tool for the mapping of branching decisions and providing a framework for solving a problem. Whereas decision trees display the set of alternative values and variables for each decision as branches coming out of each node; the influence diagram shows the dependencies among the variables more clearly than the decision tree. The decision tree shows more details of possible paths or scenarios as sequences of branches.

A decision tree is one way to display an algorithm. An **algorithm** is a set of steps or rules (a protocol) that is followed to solve a decision or derive understanding. It involves a series of decisions, where input data is arranged or rearranged to lead to an outcome (or final decision selection). Although algorithms function best in decision situations where all elements of the solution are present, they may also be used under circumstances of uncertainty. A **decision algorithm** is a type of algorithm that answers a decision problem with either a yes or no. Such problems are central to computer science and ubiquitous to the socioeconomic and natural sciences worlds.

The process of modelling and solving a problem question with two or more non-commensurable and conflicting criterion is known in the literature as **multi-criteria decision analysis** (MCA). Criterion are non-commensurable if their level of attainment, with respect to given attributes cannot be measured in common units. Criterion are conflicting if an increase in the level of on criteria can only be achieved by decreasing the attainment of another. Usually, a conflict arises when the attainment of each criteria in a decision requires the shared use of limited available resources.

> **INSIGHT:** *Models, metaphors, and premises can only be stretched, with the information available, so far, before entering into logical inconsistencies and contradictions. Therein, it is wise to perceive a contradiction or inconsistency as a knowledge gap that might be inquired more deeply into.*

There is also the idea of **decision safety** -- as in, a safety net/layer to prevent someone from taking an action that may unknowingly cause harm. For instance, in important socio-technical programmable systems there is the potential for danger; such as when mixing chemicals, there is the potential for horrible undesired toxic chemicals to be produced that would damage people and objects. The idea of decision safety is to put barriers in place to ensure actions cannot be taken/executed that would produced a set of certainly (100%) undersirable states. For instance, decision safety might start with warning after warning after even-more-dire warning will appear as user actions (byte sequences) typed into the programmable system bring them closer to a known undesired effect (e.g., toxic chemical release with a chemical production machine). Herein, it is possible to introduce a "safety layer" that would prevent those byte sequences from ever reaching the machine hardware, just in case; for instance, when a bug is introduced into the upper application layer of the code. Runtime checks are added to the safety layer to check its presence before byte execution. Herein, changes to the code have to be carefully reviewed before being checked in, including going through a checklist of items relating to the safety layer remaining in place and operational. The checklist includes a full set of unit tests that must pass in a test-bed environment before checking the code back in. The unit test cases included one for each of the potentially dangerous sequences. And, a standard [safe] operating procedure set for the user.

1.3.2 Decision optimization

We as individuals and as a community desire to arrive at optimal decisions given what we know and the circumstances of any situation, which is also a part of what we know. We have various inputs and various goals, which are transparent so that we may optimize our decision space. And herein, there arises a variety of strategies for arriving at decisions that lead toward our goals. A 'strategy' is essentially a conceptual tool. When conceptual tools actual begin to modify common systems in the habitat they are known as 'protocols' – protocols are an interface between our sensation of structure and the digital / material models of structure. In other words, our strategies become part of our protocols and our protocols routinely transform our environment as well as us. This is just basic decisioning – we arrive at decisions and our decisions have consequential feedback that affects us.

Strategies are encoded into the decisioning system through 'protocols' and 'standards'. Protocols automate the flow (or "directing control") of information which become services and productive goods in the habitat. Protocols have strategic and localized properties as well as temporal and spatial ones. Protocols are distributed across the community, which generates the potential for efficiency in designing (safety, modularity, auditing) the transport of resources. A protocol is a standardized method for controlling the flow of information using a boundary [condition] and a conceptual/mathematically patterned direction [encoded from a conceptual strategy].

> **INSIGHT:** *What are 'resources' if into packets of packets of information which are representational in different forms (e.g., sign, signifier, signified).*

Some protocols encode or re-encode conceptually formative structures into materially rendered existence; others only transform information at a digital or conceptual level. The application and network protocols behind a 3D printer are a useful example of a set of material information transformation protocols. Not only can a material rendering technology (i.e., a 3D printer) render out our conceptual ideas, but the technology itself, as a platform, is designed on another set of engineering principles that represent our emergently practical, sort of, "paradigmatic" technical understanding of the world. These are the principles we use to build things so that they function in the [f]actual world. And it is because they are not just a "social construction", but they actually function in the world [through our directed-intention], that there is a "technical" decision space where we can "run" technical protocols [that we have designed for our common fulfillment].

What is optimality as a function of an iterating time scenario? In an iterating time environment there is probability in each future iteration. In such a scenario there must also exist a spectrum of measure [while we are out of total synchronization (i.e., out of "no-time")]. This spectrum of probability (experienced as certainty and uncertainty) provides for our experience as consciousness and it is a structure for learning how to self-initiate the re-orientation of our thoughts and actions, and ultimately, coordinate our relationships.

What does a decision space do for consciousness if not provide an 'opportunity' (or "possibility"). 'Opportunity', by definition, represents a space for self-development. To remain stable, a community must maintain an environment where everyone can share in the opportunity to verify the totality of our common existence. This allows for self-verification and it facilitates the iterative redesign of a social habitat toward greater fulfillment - the opportune selection of a decision that structures greater fulfillment. This is true social integrity – to facilitate intrinsic, verifiable, and self-efficaciously learning experiences for every individual. It is from an understanding of a synthesized understanding of a system that trust in an "agreement protocol" in the system becomes possible. Herein, we state, "I don't know", until "I" know through experience and logically clarified communication. It is true integrity [in aligning decisions with a fulfilling direction] to take an interest in how things actually work without throwing anchors of belief out [as acts of fear in separation] as we learn more. We can create strategies that facilitate us in our overcoming of our own fears. We have a creative potential in all of spectral existence in which to design newly oriented technical systems when the present ones are no longer optimal.

To optimize decisioning, it is useful to simplify decisioning to its highest-level series of steps:

1. Have issue?
   A. Problem?

2. Gather information about issue.
    A. Gathering.
3. Generate alternative solutions to imagine resolving the issue(s).
    A. Generating (integrated syntheses; solution inquiry).
4. Evaluate alternative solutions to resolve those issues so that the best can be selected.
    A. Evaluating (analysis of solutions; parallel value inquiry).
5. Presenting and agreeing to a single alternative solution.
    A. Decision system protocol for coordinating master plans of habitats.
6. Executing upon to the decision by taking action in the real-world.
    A. Operating habitats and societal information services.

1.4 Change acceptance

> **NOTE:** *Adaptive change must involve the identification of patterns, such as: demand patterns; patterns of renewal and regeneration; ecological patterns, patterns of waste; patterns of efficiency; patterns of functional effectiveness; patterns of fulfillment; and patterns of fairness.*

The idea that “change” is necessary for a “higher expression [of potential]” sounds rather mundane, but its implications are incredibly far reaching, and they effect all of us to a person. It has to do with our assumptions about change. Deep down most of us don’t really recognize that profound change, radical change, extraordinary change, is actually possible. Whenever one thinks about trying to change something or reach for a higher possibility most of us tend to assume things are much more fixed, much more static, much more unchanging than they actually are. During the vast eons of our evolution things changed so slowly that in one person’s lifetime it seemed like nothing was changing at all. There was very little change visible, other than a person aging. Essentially humans are deeply wired to look at the world around us and the world within us and see it as something that is standing still, that is not moving.

Carter Fips (2012) has published a work entitled “Evolutionaries” in which he explores the emergent evolutionary world view. In this book he named the very thing which is being discussed above. In the book, Fips calls it, “the spell of solidity”. His point is that even though many people believe in evolution in some way, there is a deeper more persistent belief that the world they live in is static, is unchanging and that humans are solid or static too - "we hold beliefs, attachments". So even in the early 21st century, when technology is changing at such a rapid rate, many people still tend to assume that things are much more unchanging than they are. For instance, on a societal level when one looks out at the many problems facing humanity one may tend to see these problems as intractable, unfixable. Or on a cultural level when one looks at human greed, violence and other aberrant behaviors one may see they all seem so deeply rooted in our human nature that it would be so very difficult for anything to ever change. Its human nature after all, or so “they” say. And similarly, on an individual level, when someone takes up efforts to try and change their own consciousness and their own behavior, one frequently assumes that one's own nature and interrelationships are much more permanent and unchanging than they actually are. So this assumption of limitation is something most, if not all, humans experience.

Life is evolving in a universal cosmos, and that includes you and me. The cosmos is evolution in motion, and so are we. What this means in practice is that we need to constantly question the appearance of solidity, of stasis and to realize that things are not as solid as they seem; or are they? When you look around and see something that is stuck or immovable, you need to take a step back to a larger frame, even maybe a larger time frame. By “stepping backward” we are more likely to see that it hasn’t always been this way and it won’t always be this way, whatever it is, it is going to change.

We are in a process of ‘emergence’, of evolution, and of unfolding. Anything you can say about yourself, about the kind of person you are or what defines you, isn’t really a statement about how you are in any static or solid sense, it is just a statement about how you are now. You are fluidity, a process of unfolding fulfillment; you are not a static unchanging thing. That can be a little disconcerting to the part of ourselves that images us to be a static and unchanging being, but if you can stay with it a bit you can start to feel the thrill of being in motion, *being in the flow*.

It is only when we begin to open to this reality of unending change, the dynamic of a process that we are, that we can make room for dramatic transformation and our highest human potentials.

1.5 Decisioning and voting

> *A.k.a., Arriving versus making/taking decisions, protocols versus opinions as decisions.*

The two phrases, “arriving at decisions” and “making decisions”, are often used synonymously, and both phrases indicate that something is being decided, and possibly, planned -- that something is to be intentionally changed in the real world. The verb phrase “arrive at” [a decision] indicates the existence of a process (Read: plan and plan execution) leading to a decision. Speaking metaphorically, all decisions include a journey (as in, process and plan) prior to their destination (decision), and the usage of the verb “arrive” maintains this meaning. There are many viable travel metaphors when it comes to the discussion of decisions. The verb, "to arrive" connotes some form of travel and the reaching of a destination, which has required forethought and planning. Its use signifies that something more substantial than just a thought, opinion, emotion or belief was used when deciding.

> **CLARIFICATION:** *The verb "to make" could also simply mean decisioning about planning, if the result is something that is intentionally designed. There is also the ideas of: 1) to make a mess, which requires no planning; and 2) to make a decision based on subjective opinion (i.e., without a common objective plan).*

Unlike the phrase, "to arrive at a decision", the term "decision-making" (in its general usage in the 21st century) does not appear to convey the idea that a process led to a decision. If someone "makes" a decision based upon their own narrow (or limited) opinion of things, then the word "make" is likely appropriate. However, if a decision involved even the faintest of analyses, of calculations, of weighing and of reasoning, or of protocol, then it could also be said that the decision is being made; because, of all the technology that went into actually making the decision it. The phrases "transparent decision-making" and "decision-making process" include concepts that more clearly suggest the involvement of a process prior to the arrival of a decision.

Even the smallest of decisions by the human organism includes a process; for the process of deciding is one of the 37 fundamental cognitive processes modelled in the layered reference model of the brain (LRMB) (Wang, 2006). Thus, even if a decision was "made" based upon a single persons narrow opinion of things without any additional conscious analysis or weighing, their brain still went through some form of neural process to nevertheless "arrive" at the decision. Therefore, the difference in the usage of the terms "arrive at" and "make" in the context of deciding appears largely to speak to the degree of awareness the decider(s) has in how s/he actually came to a decision. Along this line of thinking, "decision-making" would primarily be considered an unconscious process and "arriving at a decision" a more conscious one - where the decider maintains an awareness of that which transpired during the decision process and is able to rationally explain why they selected a particular alternative.

There are a multiplicity of methods by which more than one decider may "make" a subjective decision. Voting is one of those methods. Voting involves the appearance of a process of some form prior to a final decision. However, voting is actually more of a "decision-making event" rather than a process of "arriving at a decision", for voting is a win or lose tally model in which one alternative is "won" by numbers as opposed to concern for the issue itself. Therefore, voting stands in contrast to algorithms and other decision methods that involve input and processes leading to the arrival at a final decision. In the case of voting, the process of voting is itself the final decision; even though there may have been a process of arriving at options and understandings prior to the vote. In its application, voting often appears as a contest where the majority wins the decision as opposed to the community arriving at a final decision via a reasoned and logical process of information collection, verification and processing. But then, some decisions do not have a single best outcome, as is the case with many decisions of preference (i.e., preference choice). Mob rule is having 51% of a group overrule 49%. Does that make the 51% "socially correct"? Does it mean anything to be "socially correct"? What does it mean to be technically correct? Science transcends subjective feelings at a social level through visualization and falsifiable evidence, not just through the inter-subjective counting of heads (i.e., voting).

> **CLARIFICATION:** *Consensus voting is generally when everyone agrees and/or no one significantly objects.*

Majority voting is a representation of a system that values one dominant group over another, the majority over the minority. This is otherwise known as the "tyranny of the majority". Also, when a group of people agree that majority rules, such as in "issue voting", then it could be said that it is the circumstances of the situation that "make" the decision for the group. The identifiable composition of the group creates the final decision (notice the subjectivity and objectivity; subjective group preference and objective group identity). For example, when two political parties are vying for a single political office, then the voting public with the greatest representation in the vote will "make" one of the political parties the likely winner. There are a wide-variety of other situations where environmental circumstances can "make the decision", such as when only two options are available and one of the options becomes unavailable. For example, a hiker mapped out two alternative trails prior to the hiking trip and upon arrival at the trail where the alternatives diverge, one of the trails is closed due to maintenance and safety.

Fundamentally, within any organization or group of people decisions have to be made and someone or something has to make them or, preferably, arrive at them [transparently]. The subtle distinction between the terms "make" and "arrive at" becomes increasingly important the more interrelated individuals become. The usage of an "arrive at" approach leads to the adoption of a formalized, transparent, and emergent decision process.

As long as people think in terms of "who are we going to vote for", then they are looking in the wrong direction and do not understand either the scope or the source of the problem. In early 21st century society, decisioning is highly about access to the "decision maker" or "decision leader" of the day (i.e., access to politicians and executive businessmen). In contrast, in a community-type society, decisioning significantly involves transparent modeling of the overall information space and an objective decisioning process.

INSIGHT: *The market-State has two markets, the commercial market and the political market (the market for power-over-others). In the commercial and political market, votes are cast with currency.*

1.6 Decisioning in society

Every society is composed of four primary systems: a social system, a decision system, a material system, and a lifestyle system. Coming from a market-State mentality, one might then wonder where the "economic" and "governance" systems of society are positioned within such a structure. Both economics and governance concern decisions. Governance concerns decisions about the fundamental socio-technical organization of a system inclusive of peoples lives. Economics is decisions about the acquisition and transformation of resources into needed goods and services. It is essential to understand that both economics and governance are fundamentally decision-centric systems, and both types of decisions require intelligence, planning and documentation:

1. **Governance [planning] decision documents and procedures** (socio-technical behavioral relations).
    A. Agreements and violation consequences (legal system).
2. **Economic [planning] decision documents and procedures** (socio-technical production relations).
    B. Habitat master-plan productions (global habitat societal information service system expressed through locally customized habitat service systems (a.k.a., cities).

A more complete representation of the decision-centric construction of society is:

1. **In the market-State:**
    A. **State construction legal contracts and documents.**
        1. Constitution.
        2. Legislation.
        3. Case precedentation (precedent).
    B. **Business construction legal contracts documents.**
        1. Articles of incorporation.
    C. **Family construction legal contracts documents.**
        1. Wills.
        2. Power of attorney.
2. **In community:**
    A. **Global community construction agreements and documents** (Read: the societal specification standard).
    B. **Habitat community construction agreements and documents** (Read: local master operations plan, habitat service agreements, and personal habitat profile agreement).
    C. **Personal family construction agreements.**

NOTE: *All decisions require intelligence, and hence, a decision system that encompasses societal governance and economic planning could come to be called the, "Social Intelligence Service".*

In practice, decisioning occurs throughout all axiomatic systems in any given society:

1. **Social system.**
    A. Needs.
        1. Human needs and preferences list (and ecological services list).
    B. Values.
        1. Community core values list (and stabilizing objectives list).
    C. Knowledge and methodology.
        1. Knowledge database, and educated methodology list.
2. **Decision system.**
    A. Deciding global and local agreements (i.e. global and local governance).
        1. Global citizen deciding.
        2. Local citizen deciding.
        3. InterSystem service contributing citizen deciding.
    B. Deciding economy (i.e., global and local habitat service system makeup).
        1. Resident deciding (user demands for common and personal access).
        2. Contribution deciding (InterSystem team operations).
        3. Local customized master-plan deciding working groups.
            i. Current local habitat resource allocation.
            ii. Future local habitat resource allocation.
3. **Material system.**
    A. Physical object assemblies and real-world socio-technical configurations.
    B. Production and distribution networks.
    C. Physical human contribution.
    D. Physical human end-user.
4. **Lifestyle system.**
    A. Life-phase access to habitat services (lifestyle).
    B. Service access fulfillment evaluation.
    C. Flow evaluation.
    D. Well-being and quality-of-life evaluation.

To compare the market-State to community in this context, the following is derived:

1. **Social system:**

A. **Demand:**
   1. **The market-State demand:** Wants and affordabilities.
   2. **Community demand:** Needs (and preferences).
      i. Human needs list (and ecological services list).

B. **Orientation (values):**
   1. **The market-State provides value:** Profits and purchaseabilities.
   2. **Community provides value:** Life-phase user human need through core values list (and stabilizing objectives list).

C. **Knowledge and methodology (approach).**
   1. **The market-State approach:** Schooling and employment.
   2. **Community approach:** Common heritage knowledge, tutoring, and contribution.

2. **Decision system.**
   A. **The market-State approach:** State legal documents, business legal documents, family legal documents, and technical guiding documents.
   B. **Community approach:** Personal agreement profile, commons coordination, local master-plan decision work groups, societal standards and decisioning work groups.
3. **Material system.**
   A. **The market-State configuration:** Private contracted property, inclusive of objects and intelligences (people and AI) who own and are owned as "objects".
   B. **Community configuration:** Objects arranged by contributors into physically interfaceable service systems to meet the needs of the global population.
4. **Lifestyle system.**
   A. **The market-State lifestyle:** Seeing everyone as a consumer, from birth and nurturing, through school, into poverty or employment, and then to retirement, all governed by anyone's token (monetary) net worth.
   B. **Community approach:** Free access to societal services throughout all life phases, where fulfillment is optimized: nurturing, education, contribution, leisure.

After clarifying the primary systems, it is essential to identify how access is integrated:

1. **Economic decisioning:**
   A. **In market-State:** Market mechanisms (competitive property planning; many overlapping project plans).
   B. **In community:** Community mechanisms (cooperative and coordinated commons planning; a globally oriented plan allowing for flexibility in the cyclical customizability of local habitats).
2. **Governance and administrative decisioning:**
   A. **In market-State:** Governance decisioning based on some mix of citizen direct voting, citizen-to-politician representative voting through to military dictatorial decisioning, under market-State conditions. In the State, there is legal representation (either in court, in referendum, or in political figurehead). In the market, there are legal business (all of which are property owned by one or more entities). Here, the State manages the citizens, and business mange the final productions for citizens lives. In the State, the governance documents are the constitution, legislation, and legal cases. In the market, the governance documents are the articles of formation of the business (a.k.a., articles of information, articles of trust, etc.).
   B. **In community:** Governance is more accurately called, "coordination", and is coordinated through a complex involving contribution, education, and residentation (in habitats). Here, contributors are users in a temporary phase of life, and users access societal services in a highly coordinated, cooperative and team-oriented manner. In community, the societal specification standard, is the "governance" document. Hence, in community, "governance" documents are more accurately called, the "community societal specification standard". A community standard is an integrated and unified, evidence-based societal standard representation of knowledge that informs and re-forms, reproduces and adapts the socio-technical structure of the society as community.

2 Decision modeling

A.k.a., A decision event model.

Herein, decision making refers to the directing of attention to the consequences, needs, values, data, and other factorial variables. Yet, decisioning does not just involve perceptions, but it requires analytical overlay and the systematic arrival at a decision. In truth, by the time someone comes to the end of a frameworked decisioning process the decision is very often self-evident - it frameworks the design itself. With sufficient information decisions can be somewhat rhetorically said to “design themselves”. When laying things out clearly, like way-points and obstructions on a roadmap, the decision is often self-evident. The nature of the problem suggests its solution. By resonating into a larger and more universal context a problem can be seen more clearly and solved with greater grace.

A ‘decision model’ is a visual representation of the structured logic framework, involving processes and activities, that are followed to arrive at a decision (i.e., it is a model of the decision mechanism). It models logic and is based on the inherent structure of that logic, eliminating style and other subjective preferences, ensuring a consistent and stable representation. A decision model (or mechanism) is simply a tool that allows for a thorough analysis (and sometimes synthesis) of available decision inputs and alternatives. In general, a model is a simplified representation or abstraction of reality, and many “real world models” - models that are intended to reflect the way in which the world actually works - may be significantly accurate or inaccurate in their alignment with objective reality. Decision models are used to visualize a decision space and modelling is essential to any transparent and collaborative decision.

There exist a number of decision models, including but not limited to rational, recognition, and naturalistic, or some combination thereof. In the Community the contextual environment in which the decision arises determines the selection of a decision model. When time is available, the most accurately available, rational decision model is applied toward the selection the most reasonable (best or optimal) course of action based upon the information available at the time. When an emergency (or urgent situation) with a higher degree of uncertainty is identified, then a more naturalistic decision model is applied.

A decision model must adapt to new information when it becomes available, otherwise the model is likely to become an increasingly inaccurate representation of the real world, and clearly, less rational. The ability to adapt to new information when it becomes available is commonly known as ‘strategic adaptation’. If an entity does not adapt its decision process as it receives new information, then its decisions are likely to become increasingly unpredictable and potentially less aligned with its desired outcomes. Imagine for a moment an archer who for several seconds before releasing an arrow toward a target, fails to account for the abrupt change in wind speed and direction. The final resting place of the arrow becomes unpredictable as soon as the archer stops accounting for incoming sense data about the wind. Also, as an archer is learning archery s/he will be introduced to new information that will cause him or her to revise and update the decision model being used to accurately hit the centre of the target. The archer might first be introduced to the concept of wind and then later the concept of rain -- additional concepts modify the archer’s decision model so that it more accurately reflects the consequential realities of archery in the material world.

Real world decision problems are characterized by the following conditions:

1. A list of all possible alternatives (the actions/decisions).
2. A list of possible future states (the outcomes; states of nature, of a system).
   A. A "state of nature" is an outcome over which the decision taker has little or no control.
3. Impact associated with each alternative/state (of nature) combination.
4. An assessment of the degree of certainty of possible future events.
5. A decision criterion (rules, a ruleset, requirements, etc.).

Decision problems can be formed into tables (decision matrices), for example:

Matrix Z		State of Nature (j)		
	$a_i \setminus s_j$	s_1	s_2	s_3
Alternative (i)	a_1	Z_{11}	Z_{12}	Z_{13}
	a_2	Z_{21}	Z_{22}	Z_{23}
	a_3	Z_{31}	Z_{32}	Z_{33}

- Wherein,
  - a_i - i^{th} alternative.
  - s_j - the j^{th} state of nature (event).
  - V_{ij} - the impact that will be realized if the alternative i is chosen and event j occurs.
  - $Z_{11}...Z_{33}$ - the matrix coefficients

2.1 Visualization

A.k.a., Visual modeling.

Visualization provides a visual model that everyone across an organization can point to in order to identify objects and relationships, and thus, facilitate decision alignment (between individuals). Visualization of data is essential for decisioning in community in order to ensure a shared understanding to determine a shared resolution. Making a structure visible (as well as traceable); it is possible to immediately see which parts are important and how they interconnect. Through visualization and standardization a proof-of-concept may be developed and tested. All systems can be visualized, and ought to be visualized prior to integration into a common life-support, habitat service, system. Community modeling can solve many of the world's current problems. For example, resource coordination will resolve most resource shortages when demand is filtered through human need prioritization, rather than market privatization. It is possible to visualize object and information flows. Therein, technology is not a panacea. However, it can be extremely useful in solving many kinds of problems. Fundamentally, it is important to visualize the model (Read: the system) so the users know what it is doing, how it influences, and what it is likely to create.

> **INSIGHT:** *It is possible to visualize and model common human fulfillment ("collective welfare").*

Decision visualization objectives in a community environment include, but are not limited to:

1. Cognition objective: The objective is to model the construction of the functional system as a conceptual specification by investigating the potential of all alternatives. The result is:
    1. Documentation objective: The objective is to describe and explain the possibilities and constructability of the solution specification.
        - i. Textual objective: The objective is to define terms and compose a linguistic system with functional significance.
            1. Kernel specification (core textual standard).
            2. Handbooks (manuals and education materials).
        - ii. Illustration/drawing/visualization objective: The objective is to demonstrate the possibilities, feasibilities, uses, and consequences (if,then and cause-effect) of the solution specification.
            1. Concept models (conceptual model).
            2. Drawing models (physical model).
            3. Animation models (physical and/or conceptual model in 3D and over time).
            4. Simulation models (physical model in 3D, over time, and with variable parameters).
2. Construction objective:
    - A. The objective is to assemble the construction to specification (using all the available documentation)
3. Operations objective:
    - A. The objective is to operate the construction to specification (using all available documentation).

2.2 Rational decision modeling

> **QUESTION:** *How might a society "delegate" the process of deciding to one of rational thought and logical calculation using verifiable information toward everyone's fulfillment?*

Rational decision models must at least involve a cognitive process (i.e., a decision mechanism) where each step follows in a logical order and the model is designed to rationally develop and identify a desired resolution to the decision space. Herein, the term cognitive refers to thinking through, processing and assessing, inputs and alternatives in a larger information context to arrive at a decision. As the word rational suggests, this approach means that there must exist a non-contradictory rationale for the selection of a decision. Any approach that uses non-contradictory identification and logical relationships must also use visualization tools, such as charts, flow charts, diagrams, modelling, and systems and concept mapping. (Novak, 2008) The utilization of a rational decision model ensures that consistency and efficacy exist as conceptual attributes of the decision process. Rational decision models can be visualized, and thus, more clearly communicated. And, clear communication is a necessity for transparency in a community.

Take note here that in the rational scientific method, modeling always involves objects (in relationship to one another). In this sense, all rational decisioning must account for objects. In the case of decisioning, objects are referred to, generally, as resources. Resources, like objects, can be pointed to, are "objective" (i.e., they are objects, as that with shape, that can be pointed to).

Other decision models are more subjective, and therefore, less consistent, structured, shareable and transparent. A rational decision model supports consideration of the full range of factors relating to a decision, in a logical and comprehensive manner. It presupposes that it is possible to consider every available option if given sufficient time as well as access to all relevant information.

Further, a rational decision model presumes that there is at least one best outcome, or result most aligned with a set of criteria. Because of this it is sometimes called an 'optimizing decision model' or 'holistic decision model'.

However, it is not true to state that rational models presuppose to know the future consequences of every option. Impact studies may be completed and probable consequences may be reasoned and calculated, but to state that rational models presuppose knowing every future consequence is incorrect and negates the idea inherent in the model that there must exist an identifiable and non-contradictory relationship between all objects and events in the decision space. All decision models have their limits. A rational decision model is limited by the availability of information and time, and the robustness and accuracy of the applied methods.

The predictability of a rational decision model is at least partially determined by the accuracy of the available information. Objective scientific inquiry is one means of arriving at accurate information.

2.3 Societal decision information modeling

Decision information modeling may be used to optimize the organization and coordination of a population of individuals, by accounting for and integrating the following operational elements (including, but not limited to):

1. Social-data conceptualizations (user-developer side).
2. Service-access calculations (developer side).
3. Resource-production mechanizations (developer side).
4. Scheduling-contribution executions (developer side).
5. Scheduling-product access (user side).

Herein, there are the categories of:

1. **Resource-allocation identification.** Here, the design is inclusive of resource availability.
2. **Production calculation (resource allocation calculation).** Here, the design is inclusive of resource position optimization via linear algebraic equations.
3. **Production protocol (engineering design inquiry selection).** Here, the design is inclusive of engineering optimization via a parallel inquiry process (that produces a solution to an issue as the deliverable).
4. **Service demand identification (inclusive of counting demand and identifying preference).** Here, the design is inclusive of counting and measurement.
5. **Contribution scheduling (time scheduling work).** Here, the design is inclusive of contribution effort and availability.
6. **Habitat access (resource occupation scheduling for users).** Here, the design is inclusive of access met through demand for need fulfillment, and preference therein.

At a fundamental processing level, a socio-technical fulfillment system may have decisions present at all of the following levels:

1. **Identification** (inquiries, issues *over time*).
2. **Calculation** (mathematics, computation *over time*).
3. **Resolution** (engineering, plan-design *over time*).
4. **Operation** (laboring, production *over time*).
5. **Usage** (demand, access *over time*).

2.4 Decision tables

A decision table represents the conditions in relationship to action/outputs. A decision table is a [visual, objective] framework for describing a set of related decision rules. The decision table is the structure for defining the rules between conditions and actions. Decision tables allow for a functional visual layout of decisioning information. A decision table is a precise way to model complicated logic in the context of decisioning. Decision tables are a way to model the "if, then, else" conceptual construction of action interrelationship (i.e., cause and effect). Generally, a decision table displays what actions are to be taken when certain conditions are met. Here, conditions must be related to actions (or, non-actions), where the table is filled in with all possible interrelationships.

Decision tables (flow charts, trees, and other diagrams) may be used to represent decisions. A decision table documents (complicated) logic. Decision tables allow for the organization of information such that testing all combinations of the possible conditions becomes possible. Decision tables are used derive a value that has one of a few possible outcomes, where each outcome can be detected by a test condition. A decision table lists two or more rows, each containing test conditions, optional actions, and a result.

A decision table is a test technique that visually presents combinations of inputs and outputs, where inputs are conditions (or cases), and outputs are actions (or effects). A full decision table contains all combinations of conditions and actions. A test is simply execution of an operation on the table, either testing the logic within the table itself, or adding additional logic (formula) and running (computing) the test.

A test is a question that can be answered using the data in the table and some logic (which mus be capable of being validly applied to the table). An inquiry could be viewed as a test. In fact, each of the inquiry processes in the decision system are test run on available data to ensure solutions are as expect by society.

Tables can be used to test and to derive tests. Tests can be run on tables to identify faults in the system under test and interrelationships between data. Each test will verify that certain object conditions (condition values) lead to certain expected actions or results (e.g.,as in a decision system).

All computer programs use logic (i.e., have a mechanism for expressing logic). Decision tables allow for the precise and visual representation of logic. Tables are so useful and intuitive at representing complex, logical information that they are sometimes called self-document forms of information.

A decision table associates conditions with actions to perform. A decision table contains two initial data inputs:

1. The conditions - an "if" statement.
2. The actions - a "do" statement.

A limited entry decision table is composed of:

1. Conditions - a condition is a logical statement that may have only one of two values -- true or false.
2. Actions - an action is an operation.
3. Rules - a rule is a statement that describes a set of conditions in order that a specific action can be performed. Here, a rule statement is an "if", then "do" statement (i.e., "if" condition is present, then "do" action). Fundamentally, the decision table is a structure for defining a set of rules.

However, every completed decision table has four primary parts:

1. **The condition [stub*]** - lists the individual inputs upon which the decision depends. The conditions stub (the conditions) is equivalent to a test or question, and in some computer simulations, the if section of the if, then, else logic.
2. **The action [stub*]** - lists the alternative actions that may be taken (the actions that could be taken depending on the conditions) . These are the procedures or operations are to be performed depending on the conditions.
3. **The entry [parts]** - show the conditions under which each action is selected.
   A. **Entry part for conditions.**
   B. **Entry part for action.**
4. **The rules -** each rule gives a test case.

** "Stub" stands for (is short for) structured programming.*

Wherein, all conditions relate to actions, and all actions relate to conditions. Actions and conditions are related via the logic of rules (or requirements). Afterward, evaluations of actions ensure future actions relate more closely to expected conditions, by updating the ruleset.

There are several categories decision table, which the extent of the conditions present:

1. Limited-entry decision tables - Decision tables in which all of the conditions are binary. Limited-entry decision table with *n* conditions has 2^n distinct rules.
2. Extended-entry decision tables - Decision tables in which all of the conditions have a finite number of alternative values.
3. Mixed-entry decision tables - Decision tables in which some of the conditions have a finite number of alternative values and others are strictly binary.

2.5 Decisioning perspectives

A decision space may be experienced from several perspectives. From a *psychosomatic perspective* it is necessary to examine decisions in the context of a set of individual and collective needs, beliefs, emotions, preferences and values. Alternatively, a *cognitive perspective* involves an examination of the environment in which a decision question is posed. This perspective is based on three fundamental concepts: *knowledge*, *understanding*, and *preference*. From a socio-economic *normative perspective*, the analysis of decisions is concerned with the logic of the decision process, its rationality, and its invariant consequences. Yet, at another level, a decision process is simply a logical *problem solving* activity which is terminated when an optimal, aligned, and sufficiently resolved information set is reached. Decisions may also be approached from a *holistic perspective*, which involves the collection of and attention to all relevant information. And, when information is unavailable the holistic approach inquires into the knowledge gap.

Additional notes on decisions include:

1. Studies indicate that differences (i.e., diversities) in perception, attitudes, values and beliefs can lead to different approaches to the decision process, and therefore, different decision spaces and different final decisions.
2. An ideology is a conceptual framework through which people pre-process reality and it represents a ‘bias’ in a decision process.
3. The process by which decisions are logically arrived at is an important part of all science-based professions, where empirical knowledge in a given area is used to derive informed decisions. Empirical refers to that which is observed or experienced; capable of being verified or disproved by observation or experiment.

2.6 Decisioning and societal stability

A stable social environment is necessarily an environment that accounts for the *restoration* of the individual, such that stress and ‘decision fatigue’ do not exist at a continuously sufficient threshold to cause a reduction in optimum human decision making capacity. When decision fatigue (a.k.a., ego-fatigue and willpower fatigue) and other fatiguing stressors set-in, then individuals naturally become less likely to make value-based and fulfillment-oriented decisions in personal, social, and economic contexts. And, they are more likely to turn their decisions over to someone else to make. Effortful choice is bio-physiologically costly, and humans [individualistically] have a energy resource requirement for quality decisioning. The amount of willpower that we have to apply to effort is limited. Willpower is a finite and daily regenerative resource affected by [at least] belief and nutrition intake. When decision fatigue sets in it doesn’t differentiate between big decisions and small decisions. Basically, each individual has a "budget" of daily decisions, which can be modified a little by when and how one eats, and how one thinks about themselves. (Vohs, 2005)

As decision fatigue sets in it is associated with increasingly poorer decisions - more and more indecision, fatigue, and stress, and less and less of an ability to make rational and clear decisions [as the day progresses]. Experiments show that individuals have a qualified, finite store of mental energy for exerting self-control toward decisioning. Generally, with every decision it becomes harder for our brain to continue to make decisions. The result is that by the end of a "long day", when someone is low on mental energy, that person is going to be more likely to give in to impulse (i.e., to have their self-directed freedom reduced). Also, it is interesting to note that planning [contextually] reduces the likelihood of decision fatigue because the decisions are already made (i.e., they are already planned for).

Fundamentally, our health, though particularly the healthy functioning of our neurophysiology, affects our ability to arrive at optimal decisions toward our fulfillment. Neurological damage and malfunctioning can impair our decisioning capabilities.

2.7 Who makes decisions in a community-type society?

The very question, "Who makes decisions?" is devoid of logic. It is not who makes decisions, it is by what method are decisions arrived at? The question of who makes decisions is a biased attribute that we have concocted because of our irrationally found fear of each other and groups which continue to jockey for power based on the rewards/incentives of the current system that is used as a tool for control. This blueprint describes the decisioning system in detail.

> **NOTE:** *In order to exist in a state of sustainability (with the planet) and equitability (among humanity), the allocation and distribution of common heritage resources via goods and services (i.e., the economy) ought not be influenced by personal biases or hazardous reward vested interest.*

In community, tasked actions are carried out through revolving and voluntary interdisciplinary systems teams, which assist in aspects of society that basically cannot yet be automated. The goal is to increase objective and value oriented decisioning as much as possible, and when we understand that our problems in life are technical, the merit of this approach is without parallel.

In order to arrive at an optimal final decision, coherence (alignment) of InterSystem Team contributors is necessary, which requires at least the following:

1. Precise language (technical terms).
2. Units of measurement.
3. References (sources of data).
4. Concept models (concept of operation).
5. Technical drawings and diagrams (drawing specifications).
6. Technical written documentation (written specifications).
7. Explanations and reasoning (reasoning specifications).
8. Simulation.
9. Statistical data analysis (statistical table calculation).
10. Algebraic data analysis (algebraic table calculation).
11. Humans agreeing (or disagreeing), alignment threshold decisions.

2.8 How money influences decisioning

The following is the abstract from an journal article by Kouchaki et al. (2013) entitled "*Seeing green: mere exposure to money triggers a business decision frame and unethical outcomes*", which demonstrates how money can negatively impact decisioning.

> *"Can mere exposure to money corrupt? In four studies, we examined the likelihood of unethical outcomes when the construct of money was activated through the use of priming techniques. The results of Study 1 demonstrated that individuals primed with money were more likely to demonstrate unethical intentions than those in the control group. In Study 2, we showed that participants primed with money were more likely to adopt a business decision frame. In Studies 3 and 4, we found that money cues triggered a business decision frame, which led to a greater likelihood of unethical intentions and behavior. Together, the results of these studies demonstrate that mere exposure to money can trigger unethical intentions and behavior and that decision frame mediates this effect."*

The findings show that "even if we are well intentioned, even if we think we know right from wrong, there may be factors influencing our decisions and behaviors that we're not aware of". The scientific effect seen here is more broadly known as 'priming' (values priming, behavior priming, and so forth).

3 An economic decision system

A.k.a., An economic decision event system, a socio-economic decision system, a socio-technical decision fulfillment system, a societal resource decision system, a societal access decision system, etc.

An [economic] decision system represents a set of logical relationships between processes applied to resolve issues that have opened a decision space in the real world community and may lead to the modification of the material state of the habitat. Once a decision is taken/approved, it must be executed and implemented per timetable. Decisions influence materiality, and that which humans most care about when it comes to their material fulfillment, they care about the economy. All decisions at a societal layer influence everyone's individual level of material fulfillment (and of socio-economic access opportunity). This decision system describes and explains the process by which decisions about the material environment are resolved together among humanity. "We" have options at the socio-economic level as to how "we" organize our means of access to the resources and the necessities of life.

These processes are systematically structured and represent the formally agreed upon design method by which the community arrives at economic and other decisions that impact the community's habitat. Herein, economic decisions are those decisions that concern the allocation of common heritage resources toward the design, access, and re-integrating of services and technical products to meet a set of identifiable needs using all available information. The system represents the technical encoding and re-encoding of our social information system into our habitat for a common and purposefully oriented "next iteration" of the total habitat system toward a structure of greater potential fulfillment.

The decision system is composed of systematic decisioning processes designed to address the economic movement of common resources in the fulfillment of all human needs, while sustainably optimizing and iterating designs for higher human fulfillment and ecological consideration. Therein, it is a rule set for energy exchange and transformation that defines a system for human fulfillment that accounts for a common real world information set.

The societal decision system herein is neither static nor established, but exists in a dynamic interplay with its environment, the real-world community information system. Once a community is organized around a similar information system, then individuals might begin to arrive at similar social understandings and commonly formalized economic decisions. In order to accurately orient economic decisions toward an intentional direction, decision systems must keep track of the underlying environmental conditions as well as the micro / macro changes to the coordinating system itself. If the underlying conditions used to make decisions change, then the decision itself is no longer as correct as at the time it was made. And, when the underlying conditions that inform a decision change the decisions [design] space must change.

The decision system may also be referred to as a decision[ing] model. Actions that impact the state of the various systems of the Habitat are arrived at within the bounds of this commonly developed and informed decisioning [modelled] space. It is a model that exists to support the community in taking commonly fulfilling action in the real world - "it is a model of our mutuality in a mutually ecological world".

A stable community requires a transparent and person-independent method of arriving at decisions that impact the community and the accessible, safely sustainable restructuring and redistribution of commonly inherited resources. A socially cooperative and transparently formalized decisioning method (or model) allows for the potential existence of such a decisioning system. It is a model that reduces the incentive desire, and systematically generated likelihood, of anyone "making" biased or opinionated decisions about common heritage resources. Instead, economic decisions are arrived at through a common and systematic process of parallel inquiry (enquiry) via information gathering, ordering, and synthesizing into newly feasible designs.

The decision system is designed to meet the technical needs of the community (e.g., life, technology, and social) in a manner orientationally aligned through the community's value system. The decision system involves herein involves the "calculation of a solution". Calculation is defined herein simply as the absence of opinion or bias in its decision (since the source of the information is verified and transparent - an information trace exists). It is the process of linking a solution to an identifiable problem/issue based on certainly verifiable facts (Read: confidence statements), logical understandings, and synthesized solution responses, rather than opinions. Decisions made under a political philosophy, persuasive game or contest, stand in contrast to decisions arrived at via a process of calculation being applied as a tool for an intentionally known and fulfilling purpose. In a community with an emergent, formalized decisioning calculation process everyone has the opportunity to participate in the decision process by introducing new data, knowledge, and understandings into the real-world community information system from which the decisioning model acquires its inputs. Which, begs the question, who sets up the parameters for the system; who programs the system: we do, in parallel. In community, there are co-creators and design becomes co-construction (Read: ["con" = together with] + ["struction" = structure] = [with structure]). In other words, design at a social level is "socially constructed" from an information set common to the social group. Herein, "development" [of designs] occur through the organization of a lateral [collaboration] network.

If one person's ideas are empirically accurate and another persons are not, then the methods of science and critical integration select the accurate idea and not the one more people may "think" (or be lead to believe) is right. Accurate information can be verified to be so.

As highest creators in the trophic sphere on this planet we have the greatest control over the habitat; we can caretake our ecology or we can send its dynamic life-support systems into decline.

> **NOTE:** *It is very rare for family members to fight over the food on a table when they each know their needs and can see their resources. No sensible person would turn their family into a competitive market-based system. So, why would anyone consider perpetuating competitive-based decisioning among the human family?*

3.1 What is an economy?

> **INSIGHT:** *Humanity can transform material resources together, or we can transform them against one another.*

An economy is the structure, mechanisms and relations that guide the production, distribution, and usage of goods and services in a society. In application, an economy is the acquisition and transformation of resources into needed goods and services. In this way, in a community economy, the services in the habitat are the economic services of society. Habitat services are the services that meet human need for physical goods and services for life, technology, and exploratory support. The actual physical economy (an accountable planetary common heritage ecology) is defined by common heritage resources that become needed goods and services in habitats. In community, the only purpose of economic activity is to provide for the needs (and preferences) of the people in that society – whether those needs are consumed collectively (e.g., health and education) or individually (e.g., shoes and food). Economic coordination ought to be directed to the aim of achieving socio-technically determined goals, the most important of which are common and objective human needs (and preferences).

An economy is a system that involves needs for resources, informational and physical, and is related to the acquisition and transformation of material resources to cyclically complete needs. In community, an economy involves a process of user contribution and cooperative decisioning around common [heritage] resources -- many users contributing to informational and habitational services, which is coordinated via a contribution service system.

An economy is the combination of several factors:

1. **Planning (i.e., management, coordination)** - all economies are planned; it is in how they are planned that they differ in structure. Such as, market-capital planned, State-capital planned, mixed-Public-private capital planned, or community common heritage planned. Plans (strategic) are required to meet needs in standardized manner well into the future.
2. **Resources (i.e., objects and information)** - physical and informational resources. All economies are based on resources. Physical resources are all useful [3D] objects, and informational resources are all useful [data] concepts.
3. **Users (i.e., everyone)** - human users of community with real-world human needs and requirements for fulfillment and flourishing, within bio-spheric ecology with its own needs (requirements) to continue to provide ecological services to humans.
4. **Human contribution (i.e., people)** - team users who contribute time, knowledge and skill. In community, the economy is based on user-contributors; whereas, in the market-State, it is based on combination of employer, employee, consumer (three market identities), and citizens (State identity).
5. **Deliverable services and objects (i.e., work, production)** - identify and meet need fulfillment requirements through the production of objects, the interactions between objects (services), and human contribution (i.e., service-to-others).

At the very least, all economies are composed of:

1. **People (humans).**
   A. Users.
   B. Workers (InterSystem team members).
2. **Objects** (a.k.a., materials, resources, technologies).
   A. Intermediary, used by the InterSystem team to produce the societal informational and local habitats system.
   B. End-user (a.k.a., goods, products, service-objects, etc.), used by individuals living in a community network of habitats for personal and common access.
3. **Services** (a.k.a., actions, techniques, processes, productions).
   A. Contribution as a service.
   B. Planning as a service. (a.k.a., organized decisioning, coordinating contribution).
   C. Common and personal access as a service.

In any economy, there are decisions about resources and the motions of resources; wherein, (motion is measured based on observable quantities in native units):

1. Human motion (labor time).
   A. Time (for humans).

2. Motion of objects (mechanical causes and effects).
   A. Volume (for machines).
3. Electrical power (energy technology).
   A. Power (for machines).
4. Computational power (computing technology).
   A. Computers (for optimization).
5. Social motivation (duty, intelligence).
   A. Education (for motivation and contribution).

Through work, people and resources, an economy is born, and human flourishing has a potential. All economies are thus based on:

1. Work[ing] events:
   A. Contribution through effortful coordination (team).
   B. Contribution through completion of survey and feedback (user).
2. People (a.k.a., humans), who are:
   A. Team access contributors.
   B. Users accessors:
      1. Common access.
      2. Personal access.
3. Resources (a.k.a., objects, technologies, materials, etc.).

Economics can happen at two broadly categorized scales, which occur together in an integrated manner in community, and occur in a separated manner in the market-State:

1. **Micro-economics (individual-ized)** - individual user in community, or consumer and business, economic decisioning.
   A. In this decision system, micro-economics concerns each of the parallel decision inquiry sub-processes.
2. **Macro-economic (social-ized)** - global/planetary in community, and State, Union, nation, country economic decisioning.
   A. In this decision system, the macro-economy consists of global resource coordination, global demand assessment, global production and distribution protocols, and a global access system.

Economic [planning] decision elements include (socio-technical production relations).

1. Humans with economic demanding needs and preferences.
2. Fulfillment requirements.
   A. Current fulfillment operations/produces.
3. Resource requirements.
   A. Resource survey.
   B. Resource availability.
4. Contribution requirements (skilled labor-time).
   A. Contribution survey.
   B. Contribution availability.
5. Decision requirements.
   A. Global decision inquiry.
   B. Local decision inquiry.
6. Next solution design.
   A. Global community fulfillment
   B. Local habitat fulfillment.
7. Executable economic projects.

In practice, an economy is the acquisition and transformation of resources into needed goods and services through a single office and single factory (as one economic unit of production, together). All production, as tension along a rope, has a material change side and an information standard side. Effectively, all economies are composed of work in offices (standards) and work in factories (a.k.a., habitats). It could very generally be said that an economy is a single office and a single factory. In community, the global network of habitats could be viewed as the economy. In the market, an economy is where trade occurs, observed as barter or price. In the State, an economy is where the provisioning of finance and power-over-others ("authority" to use violence) is observed. Effectively, in the market-State, resources and labor are allocated based on profit considerations, rather than fulfilling human needs.

> **INSIGHT:** *Historically speaking, economies have been about: Who gets what (i.e., what people get what), and also who are considered people.*

An economy is sustained by acquiring resources and transforming them into needed habitat-service fulfillment products. The most important factor (besides shelter) being, food. An economy is the acquisition and transformation of resources into needed goods (and services), the basis being shelter and food. A societal decision systems relates master habitat design planning (habitat architectural master planning) to master habitat resource planning (economic statistical calculation).

Different societal system have different perspectives on what an economy is. Differing views on the conception of economics include, but may not be limited to:

1. **The monetary, competitive view -** economics is the problem of the [optimal] supply and demand of goods via the method of trade. The market economy is a competitive economic game for access to scare resources.
2. **The community, cooperative view -** economics is the problem of the [optimal] fulfillment of human requirements via the method of modeling. Community is an intelligent and collaboratively assembled societal operation.

In Greek, the word 'economy' means "the management of a household, with an emphasis on preserving one's environmental support system". A 'natural law economy' is an economy that bases decisions about resource transformations and human fulfillment on the most accurate information model of the "lawfully natural" reality presently known. By this definition there are some "economic systems" that are actually anti-economies, because they are not based on models of human need fulfillment and on the sustainability of the lifeground from which all material needs are by necessity, regeneratively fulfilled. The aim of a fulfillment-oriented economic model is to "economize", to be efficient and to conserve, and hence preserve ecological human fulfillment services. Herein, a responsive economic system responds to the coherent issuance of human needs in a fulfillment-oriented manner.

> **CLARIFICATION:** *An economy with a "market" means that the economy includes some amount of property exchange/trade. A market-economy is a sub-type of economic system. In a market-economy, there are three possible elements to trade: people (selves); objects (technologies); and information (data).*

The informational environment of an economic system is primarily encompassed by its decision system -- an economic system is a decision system at a higher level. An economy is a decision system that accounts for data about resources when resolving issues. An economy is the [efficient] transformation of resources (objects) into needed services and usable objects (products) through decisions. There are many ways of deciding the transformation of resources, some of which involve coercion, others involve trade, some involve contribution, and some involve transparent externalization of their algorithms.

Herein, economics refers to the decision space where human needs (demands) for resources (and their socio-technical configurations) are decided by, and for, individuals among a population. Simply, economics is concerned with the formation of a social decision space where choices are taken concerning the transformation of resources into needed goods and services. Economics refers to the coordination ("management") of resources. The question then arises, how do populations (people together) select the best choices for the transformation of resources into habitat services? More specifically, how does the population get the most fulfilling and optimal outcome from a situation?

An human [life] economy should be measured based upon human needs, resources, and the carry capacity of the environment. Therein, an economy can operate without a price mechanism in that the information required to make the economy work can be performed by computer simulation, extrapolation, and calculation so that the value and demand is represented within a software system. Simply, it is possible to develop a computational system to automate the analysis of human demand and environmental supply (e.g., economic computing).

The very purpose of an economy is the fulfillment of human material need. Therein, one of the functions of an economic system is to provide the capability to order and organize our fulfillment and our life[style] in a particular manner. The economy is the material foundation of social survival. Of note, the basic economy of the world is in fact photosynthesis, the stored sunlight of the world from which everything flows. In a very real sense, photosynthesis is the basic economy of the planet, not money.

An economic model is like any other model, it is a theoretical construct representing component processes as a set of variables or functions, and a description of the logical relationships between them and among a whole. An economy is the human and technological activity involved in the production, exchange, distribution, consumption, and regeneration/recycling of resources, goods and services, in an efficient manner on the basis of all available information, including human need and a known orientationally desirable value state. In other words, an economy is a material resource transformer. It is a formalized information framework for transforming resources in a common (i.e., community) manner. It transforms resources into more fulfilling and more complex resources, while accounting for their re-integration into the larger ecological system from which further information is gathered.

An economy is a formalized approach toward the allocative transformation of resources into the fulfillment of service needs. There are a multitude of reasons why societies have difficulty in formalizing an economic model. The two most prominent issues are (1) they don't get on the "same page", they do not have a common social organization and they have not identified a functionally useful methodology (e.g., the systems methodology); and (2) they maintain pre-existing (i.e., established) structures that conceal elements of the total societal system, hindering transparency (e.g., government agencies & business entities), which negate the potential for formalizing a set of emergent and common understandings [between fulfilled individuals]. In order to maintain systematic fulfillment of human needs at the community level the individuals within the community must maintain a systems-level approach to systems level issues. The systems approach isn't effectively applied to an established economic system; such behavior is known as "patchwork", which is not systematically enabling (of new intentional system states).

In an economic sense, the social domain holds information on the practices, research & discovery, work-group standard selection, and material expressions associated with the production, use, and management of [spatial] resources'. Economic components can be, for example some of the high-level categories of flow of some-thing are: individuals, information systems, spatial systems, InterSystem Teams, and algorithmic coordinators. Some ways of coordinating an environment are better at meeting human needs and generating human flourishing, than others.

A "true economy" continuously increases in its efficiency as a process of adapting to a dynamic, governing environment. This sort of economy values actions that are scientifically correct, and hence, provide a certain probability of accurately orienting. It necessitates strategic accounting, allocation, and design as derived from proven technical parameters that assure maximum efficiency and sustainability.

What is the difference between "true economics" versus an ideological economic philosophy built upon a series of pre-suppositions that have been given the illusion of permanence? A true economic system is emergently designed and iteratively developed upon transparent empirical findings from the natural world; for if a community behaves in ignorance of existence, then it cannot orient and will "suffer" the natural consequences of the governing system dynamic (i.e., technical existence). An ideology is an orientational philosophy built upon pre-supposed ideas that may or may not have any relation to the real, existent world -- it is the difference between a systems-based approach and an approach that applies the filter of an "-ism".

The integrity of any society, of any socio-economic system, is best measured by how closely aligned its structure and functionality are to the governing regulations (laws and principles) of nature. We can biomimic functional ecological patterns more precisely with more accurate information. And, there are great benefits to this for higher potential expressive fulfillment of our community.

If a society behaves in a manner that negates nature, then it will suffer the technical consequences of nature, which cannot be anthropomorphized. If a society dumps a toxin in their water supply, then such a society will suffer the biological effects (and social ramifications) of that action. If a person consistently gets poor quality sleep, then their biological and psychological well-being will suffer.

The Decision System herein is not an "authority-based" model. It is simply an emergently agreed upon model, commonly developed and informed by a distributed, open community of sharing and cooperating users. New discovers improve the model and do not threaten "establishments" and "institutions", as there are none. Established interests generally seek to limit the transition to systems that might interrupt their establishments (e.g., "market share"). An institution is established by long practice and often develops its own rules. Institutions put up walls to prevent empathy and clear thinking with others. In particular, established institutions maintain an authority-based structure. Transition attempts in a system of established interests (of hierarchical power) are often met with great resistance by the established interests themselves.

Every economy requires at least these two inputs: (1) *human activity* and (2) *technological activity.* And, in a monetary economy *financial activity* is the 3rd input. However, we are not discussing a monetary economy here -- this is a systems-based economy (*3rd activity* = a transparent system approach), and hence, it is dynamically accountable. In a stably oriented and "true economy", an increase in technological efficiency should lead to new technological activities replacing banal human labour activities to free human individuals in the community to more greatly explore their own higher potential of fulfillment. In other words, new technological developments should lead to increases in automation and mechanization activity, services which have the potential to accomplish technical tasks with greater efficiency and to free humankind to develop itself and its capabilities toward higher potentials of existence.

In order for individuals to trust a decision to achieve a set outcome, there is a need for a plan and set of materials to increase certainty:

1. A plan for orienting people from dis-similar societal backgrounds to the operational state of the community-based societal system.
2. A set of materials for facilitating orientation tailored to unique societal backgrounds.

To have 100% trust in a system you must have 100% transparency of that system. Without needing to ask permission and without the belief in authority the real world is open for anyone to *inquire* into, *create* and innovate through, and to *share* mutually. A group of individuals with a shared social orientation toward real world fulfillment are likely to recognize that to act socially they need a model that comes as close to the empirical world as possible. They need a decision model whose outputs (i.e., habitat modifications) are capable of approximating desirable value conditions, those values that fulfill the community's ultimate purpose and goals.

As humanity, we can no longer have erroneous and duplicitous socio-economic systems held in place by elite establishments. A true economic system serves the habitat (i.e., caretaking) and our community (i.e., a consciously interrelated service system), which relies on the habitat for its continued existence.

The economy is ultimately the result of [a set of] core decisions about personal direction and orientation, which might involve questions about the exercise of power and control, and the design of systems that generate states of fulfillment. Herein, some common questions might be: who produces what, for whom, under what structural conditions; who benefits and who doesn't? What is the economic structure of our society and what paradigm of thought regenerates it? Economic power and social power are closely related, they are similarly encoded. And, in some countries they are so related they are almost impossible to tear apart.

Essentially, in order to understand a socio-economic system it must be examined as a whole [information] system. When discussing a society's economic system, said discussion [absolutely] must contain a description of the organization of the social system, which encodes and re-encodes the economic system. If a social system does not encode an economic system with great forethought (i.e., with "universally preferential values"), then its economic structure is likely to maintain a persistent state of insufficient basic and social need fulfillment. An economic design description that does not contain a sufficient description of the social organization that foundations its design is quite unhelpful. To clarify the notion of "encoded", this refers to a system's structural attributes (e.g., values) such as needing, for example, "to compete" in order to succeed [in the market economy]. Encoding refers to structure that is built into the system's framework, or encoded and reinforces particular behaviors.

All human behaviors are part of a [human] network. There are downstream network consequences to all behaviors and decisions. In other words, there are network effects to behaviors (and decisions), which propagate throughout the human population [network] from a source (event) to a 2nd network entity, then 3rd, and so on.

Significant questions for the generation of an economy might include:

1. How can we live and flourish within the real limits that our planet gives us?
2. What is a necessary and sufficient condition for sustained fulfillment and ecological consideration?
3. If the rules of a socio-economic environment maintain a primal state of competition among persons in a society, then what are the biological, psychological, and sociological results of that?

A true economic decision system is simply a formally engineered system, into which we feed our demands for a comprehensive service feasibility evaluation, based upon factually informed protocols (e.g., efficiency and sustainability protocols).

3.1.1 "Linear" and "circular" economies

Simplistically speaking, a "linear" economy refers to an economic flow in which raw materials are used to make a product, and after use, it is wasted (i.e., disposed of in a landfill). Such waste may include, for example, the product itself and its packaging. In contrast, products in a "circular" economy are designed to be reused and recycled. In an economy based on materials cycling, materials are reused and decomposed.

3.1.2 Planning and economies

A.k.a., Planning and socio-economic, socio-technical systems.

Economic planning occurs in all configurations of society; however, different configurations of society conduct [socio-]economic planning differently:

1. **The highest-level category of plan:**
   A. **Macro-economic plan**: The breakdown of total production (i.e., the breakdown of total labour time) between various highly aggregated categories of end use.
      1. **A macro-economic plan for the market-State** - must answer the following: How much to the provision of social goods such as health, education or socialised child-care? How much to the accumulation of means of production to augment the future productive capacity of the economy? How much (if any) to the repayment of debt or the acquisition of assets? How intensively the economy's given productive capacity should be exploited? How much money supply? What are the corporations and States secret and public high-level economic plans?
      2. **A macro-economic plan for community** - involves the transparent prioritization of material state reconfigurations (i.e., modifications to the material environment) from a life-grounded base of needs, which become engineering requirements for configurations of common heritage resources. It must answer the following: What is the societal project? What is the standard for completion of the project? What material configuration is required (for humans to flourish)? When is "it" required? In what condition is "it" required? What resources are available? How will those accessible resources flow into an optimized material state-dynamic consisting of aggregated services and objects of end-use, prioritized by life need, and oriented through a value set? Where is the standard that informs how needs and preferences are met?
2. **Middle-level category of plan:**
   A. **Strategic plan:** The global information system within which there is a decision system that accounts for global common heritage resources and all human demands.
      1. **A strategic plan for the market-State** - concerns the changing industrial structure of the economy. Here, there are business plans and industrial plans. Given that so much of the available labour-time is to be devoted to public provision, so much to consumer goods, and so much to producer goods, which particular sectors should be developed, exploiting which technologies? Which types of goods should be imported, because they can be produced more cheaply elsewhere?

Which industries should be phased out over the long run? How much can be produced for how much profit? What are the corporations and States secret and public middle-level economic plans?

2. **A strategic plan for community** - concerns the service support structure of the material system. This is the information model for the global habitat service system structure (i.e., life, technical, facility, etc.). How much of each individual service or object must be produced? When must it be produced? How must it be produced? Who needs it? Where do they need it? What is the sustainability, freedom, justice, and efficiency of the plan? Where is the strategic plan to meet the needs of the whole population?

3. **Lowest-level category of plan:**
   A. **A detailed production plan**:
      1. **A detailed production plan for the market-**State - for the precise allocation of resources, by means of local business plans, local zoning plans, local city plans and laws. Which specific types of goods are to be produced in what quantities, using how much labour, and in which locations? Which productive units are to receive inputs from which others? What are the salaries? What are the profits? What are the corporations and States secret and public low-level economic plans?
      2. **A detailed production plan for community** - a locally customized habitat service system (city) engineering plan. The local habitat [support service system] master plans. What are the preferences? Where are the preferences? Who is having a preference? Is the plan a good fit for the residents of the local habitat? Where is the unified plan to meet the residents preferences?

The societal economic planning categories of a market-State system do not correlate precisely with those of a community-type societal system. The general notion of economic 'planning' in the market-State has no unified [life] orientation. The market-State is easily observed to prioritize market services at the expense of community, aesthetics, open spaces, etc. To those who believe in the market, the market becomes the priority. Community is an environment of trust and togetherness, and therefore, planning takes on a service-to-others orientation at the societal level. All socio-economic systems can be modeled. A community-based socio-economic system is based on open and transparent modeling. In the early 21st century, most of the models that visualize the operation of society are either (1) difficult to come by, because they are secret/proprietary to profitable organizations, or (2) they are absent entirely and have never been fully visualized.

3.2 A socio-economic system

A.k.a., A socio-technical system.

The term 'socio-economic' implies that there exists an inherent relationship between a society's social organization and its economic organization. Both social and economic relationships concern how we interrelate and to whom we relate. Herein, social interrelationships can organize, if effectively coordinated, the sufficient fulfillment of all known economic need through a commonly decisive, socio-economically frameworked systems approach.

> **NOTE:** *Whereas the Social System models social issues, the Decision System models material problems, which are also social problems.*

A community requires a way of thinking about society that is designed to actually meet human needs. A design that has the potential to provide every human being in the community with a shared high-quality of living, at any scale, while protecting the integrity of the environment (i.e., our home and habitat), and removing the basis for scarcity-driven sources of conflict (including war and poverty). A community necessitates a more systematic, critical and scientific approach to "economics", one whose reference is the real world, "natural law", and the Earth's resources, rather than the movements of money, and the exchange of products and gifts.

It cannot exactly be said of a true socio-economic system that within such a system "collective interests transcend the individual interest". If social and economic systems "transcend" (Read: eclipse or are superior to) the individual, then they cannot at the same time claim that they are designed to fulfill the needs of individual human beings. The statement, "transcend the individual," indicates the potential or even need for the establishment of a power hierarchy over the individual such that s/he remains in-line with the "transcendent" system. Such is the type of euphemistic claim an "authority" figure might make. In reality, social and economic systems do not "transcend" the individual interest, and the use of such language is not a correct way of describing a community's decisioning organization. The socio-economic systems of a community are an interest of each individual in the community, and they arises out of the individuals desire to have his or her needs fulfilled in a cooperatively organized manner. Systems cannot be said to "transcend" the individual when they are informed by individuals. Note that sometimes the concept "to transcend" is being used in place of the idea of "emergence"; in such a case it would be preferable to actually use the term, 'emergence'.

Economic decisions have individual, social, and ecological ramifications. And, economic decisions are the products of the encoding of social understandings.

NOTE: *When corporations create [social] culture through their designs and the release of profit-oriented products, then the integration of commonality into community is unlikely to be present. It is fundamentally unwise to allow an economic system to modify its accompanying social system haphazardly, which is [in part] that which is occurring when market entities "create culture".*

3.2.1 A socio-economic network

A.k.a., A socio-technical network.

An economy is the comprehensive interaction of lots of individuals (or "actors") interacting among networks of interaction. A network is an interconnected system interacting for mutual assistance [the basic unit of which is a 'resource']. Out of all of those individual interactions emerges a set of patterns and behaviors. In other words, the economy is a complex and distributed system (in reality) which may have several dominant attributes causing it to express particular patterns and behaviors among its observed network. Through questioning we come to identify and clarify. To identify an economy's access structure one might first seek to uncover its incentive structure. Someone might ask: What is the 'economic value' (or "wealth") in the economy? Is it, what I have in my bank account?; Is it, what the GDP statistics say? What is the measure we might use when we think about wealth and the direction we orient ourselves toward the whole network of lots of individual interactions? Here, we take pause, to ask, "What are human needs?" What are the real solutions to human problems in a 'trophospheric ecology' and what are 'empty signifiers' of well-being?

QUESTIONS: *Is "wealth" the accumulation of solutions to problems that involve our entire human society? Is growth, then, the rate at which those solutions are being created and made accessible?*

A wealthy society has solved lots of problems, while structuring an environment that fulfills our beings. Because these economic network systems are complex and adaptive, their natural inclination is to concentrate both advantages and disadvantages; they are multiplicative. The question of our fulfillment then becomes, "Is 'access' to resources being concentrated in the hands of the few, or is an abundance of access being used by us to explore our higher potentials." In every complex economic network there are self-reinforcing feedbacks throughout the system. Conversely, and for example, growing wealth concentration is inherent to capitalism (Piketty, 2015) and "poverty" is a consequence of its behavior.

What is progress; is it anything that pushes money around an economic system? The view of progress as monetary circulation leads to the stereotypical business ethic: If you can make money doing something you should make money doing something. The business of business is not to solve societies problems, which is dangerous to the continued circulation of money which maintains business.

The change in perspective offered by the view of a distributed network architecture can lead a much clearer conversation about priorities, structures, and decisions.

3.2.2 Socio-economic system planning

A.k.a., Socio-economic planning, socio-technical planning, economic planning, economic plan evaluation.

Planning is necessary for all socio-economic functions. There are three general types of possible economic planning in society:

1. **In-natura economy** - originally, an economy that uses barter. This type of economy has a market, but does not use money/tokens. Economic planning "in-natura" refers to an economic [planning] system where goods and services are directly exchanged or distributed based on their physical characteristics or quantities, rather than using a monetary system. In-natura planning is often associated traditional barter economies. Here, the planning does not involve products/ services being converted into a tokens. The goods are directly exchanged or provided in their physical form, without the involvement of money as a medium of exchange. Exchange within an "in-natura" system typically involves barter or non-monetary transactions, where goods or services are exchanged directly between parties based on the party's specific needs and available resources. The valuation and allocation of resources are primarily based on their inherent useful qualities. Here, there is the prototypical [primitive] market. In-natura systems, which involve direct exchange (non-monetary transactions), do not require extensive mathematical modeling in the same way as the two formalized economic systems. Instead, barter systems rely on practical considerations, negotiation, and the inherent value or usefulness of goods and services being exchanged (as well as the ability to manipulate the other parties in a trade in order to advantage the trade for oneself). While mathematical techniques might be used for specific calculations or assessments, the overall functioning of in-natura systems does not rely heavily on formal mathematical frameworks.
2. **In-natura economic planning (a.k.a., planning in-natura, innatural planning, economic calculation in-natura, quantity-based economic calculation planning)** - a formalized economy

based on natural units (i.e., natural quantity units), including labor hours. An in-natura economic plan is devised "in natura", meaning that it is devised in quantities of different objects and services that are to be produced and used in the production of other goods and services. In other words, an economic plan is devised "in natura" means that it is devised in quantities of different objects and services that are to be produced and used in the production of other goods and services. This type of economy may or may not use tokens (i.e., may or may not have a market, may or may not have price/exchange). Economic planning "in-natura" refers to a system of economic planning where goods and services are allocated or distributed based on their physical quantities (e.g. meters, m^3, watts, seconds, etc.) and the services themselves (e.g., life, technology, etc.), rather than through monetary (token/price) means. Calculation in-natura needs no commensurate units. It doesn't need money, labor time, or units of utility. Instead, the utility of a plan is assessed directly in what it does for humanity (i.e., in terms of the support services of life, technology, and exploratory). It requires a comprehensive inventory of resources. This type of planning focuses on meeting specific needs or fulfilling certain known criteria, rather than relying on monetary transactions. When common, objective human needs are accounted for, then planning must be done, at least in part, in physical terms (including, working hours/years, physical resources, and utilized services). Here, there are three in-natura units:

A. Natural physical quantity units (a.k.a., natural units).
   1. For example, grams, meters, meters cubed, seconds, etc.
B. Labor time as a unit (a.k.a., natural work units, socially necessary labor time units).
   1. For example, seconds, hours, etc.
C. Habitat human-need service units.
   1. Life (including: architecture, power, etc.).
   2. Technology (including: communications, transportation, etc.).
   3. Exploratory (including: education, technology development, etc.).

3. **In-kind economic planning (a.k.a., in kind planning, planning in-kind, planning in kind, in-kind calculation, in kind calculation, calculation in-kind, calculation in kind)** - a formalized economy based on "in-kind" calculations that take into account the quality, attributes, or characteristics of objects and services. This type of economy may or may not use tokens (i.e., may or may not have a market, may or may not have price/exchange). Economic planning "in-kind" refers to a system of economic planning where goods and services are allocated or distributed based on their specific characteristics or types (i.e., need/service categories), rather than through monetary means. It involves categorizing goods and services into different types or service classes, and ensuring a fair/appropriate distribution of these categories. Here, the goal is to match available resources to productions to fulfill specific needs or objectives. In-kind and in-natura planning involve providing specific quantities and types of service-objects to individuals (or habitats) based on their needs. A community-type society uses in-kind and in-natura economic planning based on human needs separated into life, technology, and exploratory support service categories (as well as other categories). Community produces and distributes human fulfillment based on needs, and not entitlements; because the later, entitlements, is likely to create or exacerbate class divisions in society. In community, all economic planning and engineering is based upon (at least) human needs, engineering calculations, and resource availability. In-kind systems often employ mathematical optimization techniques, such as linear programming, as pioneered by Leonid Kantorovich and Wassily Leontief. These techniques are used to allocate limited resources efficiently and facilitate the optimal distribution of goods and services via calculated plans. Kantorovich's work on optimal resource allocation and Leontief's input-output analysis provide mathematical models for planning production and consumption without explicitly incorporating money or prices. In-kind calculation is calculating in terms of use values (a.k.a., services) in order to coordinate the fulfillment of all human need. Here, there are services (e.g., life, technology, and exploratory), that meet human needs, and to which material resources are dedicated and become occupied within (a.k.a., service units, technical units, socio-technical units, production units, habitat units).
4. **Monetary economic planning (a.k.a., financial planning, business planning, money planning, cost planning)** - a formalized economy that uses currency/money (has a market, includes money). Economic planning "with money" refers to an economic [planning] system where exchange transactions are typically conducted using currency (money), and the value of goods and services is measured in monetary terms. This type of system relies on the use of money as a

medium of exchange, unit of account, and store of value. The pricing and allocation of resources are determined by market forces such as supply and demand. Here, there is a market for the exchange of goods and services for money, and there may even be financial markets for the exchange and growth of finances themselves. Here, all economic planning and engineering is based upon (at least) money availability. Monetary systems are typically associated with neoclassical economics, which utilizes mathematical models based on microeconomic and macroeconomic principles. These models often involve concepts like supply and demand, utility theory, production functions, and general equilibrium theory. Mathematical tools used in monetary systems include calculus, optimization theory, game theory, and statistical analysis. These models incorporate the role of money, prices, and markets in resource allocation, and the mathematics involved helps describe the relationships between various economic agents and variables. Monetary [market] systems are typically associated with neoclassical economics (a.k.a., bourgeois economics, bourgeois political economics, etc,), which utilizes mathematical models based on "micro-economic" and "macro-economic" market-based principles. These "mirco-" and "macro-" market models market-based definitions of the following primary economic concepts: market supply and market demand, market production functions, general equilibrium theory, and game theory. Fundamentally, by comparing money costs with money profits (and other benefits) one may arrive at a rational monetary-wealth maximizing course-of-action. In this configuration of society, only money provides a rational basis for comparing costs.

3.2.3 Basic economic accounting

In the context of developing a comprehensive taxonomy for understanding and constructing a community-type society, especially from an engineering and societal development perspective, including physical resources and basic economic accounting is essential. These elements play fundamental roles in the design effectiveness and operational efficiency of any society.

1. **Physical resources:** Physical resources are acquired by means of cultivation, mining, and materials sciences. Physical resources have the following attributes:
   A. **Acquisition:** The processes and strategies for obtaining physical resources, including land, materials, and energy sources. This involves negotiation, trade agreements, sustainable sourcing practices, and consideration of environmental impact and resource scarcity.
   B. **Quantity:** Assessing and planning for the amount of each resource needed to support the community's operations, growth, and sustainability goals. This includes forecasting future needs based on demographic trends and technological advancements.
   C. **Quality:** Ensuring that the resources acquired meet certain standards necessary for their intended use. Quality control measures, testing, certification, and monitoring are essential to maintain the integrity and safety of community operations and products. In application, materials (as elemental substances) have properties, and objects (as assemblies) have functions.
2. **Basic economic accounting:** Wherein, an economy is the planned acquisition and transformation of resources into needed goods and services (their cycling in the habitat and larger ecological biosphere). These basic units of account for an economy include:
   A. **Labor time accounting:** All organizations (partnerships) usually calculate with labour time internally, but switch to money at the boundary of the market. The internal measurement and valuation of work contributions in terms of time spent. This approach emphasizes the equitable distribution of work and rewards within the community, fostering a sense of fairness and collaboration.
      1. Labor time accounting software:
         i. Arbeitszeitapp [github.com/arbeitszeit/arbeitszeitapp] - an open-source planning interface for organizations, enabling a work-time management interface for organizations and workers.
            1. Tasks available to users of the software include:
               a. Plans can get filed and approved.
               b. Products can get published.
               c. Work and consumption can get registered.
            2. There are three user roles:
               a. Organizations can file plans for each product (or service) they offer. A plan describes a product and defines how much working time will require ("cost").
               b. Members are workers in a production organization. They receive work tokens ("price certificates") for their

worked hours. They can use them to consume products and services priced in those tokens/certificates.
 c. Accountants are delegates of the cooperating network of production units. They can approve production unit plans based on collectively agreed criteria.

B. **Monetary accounting (trade/transactions at market boundaries):** While labor time may serve as an internal metric, interactions with external entities (like markets) typically necessitate the use of money. This requires the community to establish exchange rates between labor time and monetary units, coordinate financial protocols and accounts ("wallets"), and engage in traditional economic transactions.
 1. Traditional cash-currency financial software.
  i. GNUCash [gnucash.org]
 2. Crypto-currency distributed ledger banking software.

C. **Resource budgeting and allocation:** The process of distributing available resources (both physical and financial) to meet the community's strategic and sustained needs and objectives. This involves prioritization, efficiency optimization, and contingency planning to ensure resilience and sustainability. This involves thresholds and the accounting of resources to strategically developed master solution plans. In this case, thresholds are "budgets", and going over threshold in a biosphere is a "cost". Here, resources are allocated to human requirements.

D. **Societal standards and practices:** Developing standards that integrate the long-term understanding and economic health of the society, such as investment in community-type habitat settlements (i.e., investment in a network of community-type habitats/cities).

E. **Societal Standards Development Platform:**
 1. **Versioning software:**
  i. Github [github.com]: Utilized for collaborative development of societal standards, practices, and documentation, enabling communities to contribute to and evolve community-type habitat settlement guidelines.
 2. **Engineering software** (a.k.a., collaborative design software):
  i. Text.
  ii. Vector.
  iii. 3D Object.
  iv. Simulation (i.e., moving 3D objects).
  v. Calculation.
 3. **Human need accounting:**
  i. Assessing [of human need] software:
   1. Surveying software.
  ii. Mapping of survey data:
   1. OpenStreetMap (OSM) with Custom Layers [openstreetmap.org]: For geospatially mapping [community] resources, [human] needs, and [societal] services, OSM can be adapted with custom layers to visually represent and manage the distribution of resources and services according to human needs.

F. **Decision accounting:** All organizations visualize and plan to execute changes in order to adapt the environment to their visualization.
 1. **Project coordination (project accounting) software.**
  i. Approval.
  ii. Coordination of project lists, inclusive of persons, roles, tasks, deliverables, schedules, risks, decisions, etc.
 2. **Economic calculation software.**
  i. Economic plans for physical quantities of resources to be allocated to human need fulfillment within a habitat service system structure. Here, there are software for the development of economic plans for the allocation of physical quantities of resources to meet human needs within a habitat service system structure, including both in-natura and in-kind plans.
   1. In-natura plans - tables of allocations of resources to habitat services where all resources are measured in physical mass and material characteristics and all services are measured in human need completion/actualization.
   2. In-kind plans - conversion between
   3. Open source matrix linear programming software by [drive.google.com] based on the lp-solve package [sourceforge.net].
   4. lp_solve [lpsolve.sourceforge.ne]: A Mixed Integer Linear Programming (MILP) solver, which is open source and can be used for solving allocation and planning problems.
   5. GAMS (General Algebraic Modeling System) [gams.com]: Though not open source, GAMS is a powerful tool for formulating and solving linear programming problems and can be used for economic planning and resource

allocation.

6. SciPy: Specifically, the linprog function within SciPy, a Python library for mathematics, science, and engineering, can perform simple linear programming calculations and can be adapted for economic planning.

3. **Decided voting-protocol survey for participant decisioning.**
   i. Distributed autonomous digital ledger smart contacts, with code-based legal backing.
   ii. The stated method of governance of the group, with contractual legal backing.

4 The macro-economic structure of community

A.k.a., A macro-economic decision event system.

The decision system macro-economy (means of [habitat] production) may be subdivided at a high-level into a set of general production elements. These categories are akin to a narrative, which basically says, "As a community, what is technically possible is ..."

The core macro-economic sub-divisions are (Joseph, 2013):

1. **Global Resource Coordination (a.k.a., global resource management)** is the process of tracking resource usage, and hence, working to predict and avoid shortages and other foreseeable resource problems. The flow of resources is coordinated through openly trusted and emergently modified "designed-in" control.
   A. We identify what is available through continuous resource surveying/monitoring.
   B. Global resource management is integrated in the decision system for community into the parallel inquiry space in the form of a Resource Inquiry working group for identifying, surveying, and analyzing resources.
2. **Global Demand Assessment (a.k.a., global demand survey)** is the process of surveying, assessing, and realizing the demands of the human population. Herein, the system structures the transport of information so that everyone can be made aware of new technical possibilities, and there can exist system-wide [socially] optimal solutions on *how* and *what* to produce. The global demand assessment identifies and processes the *needs* and *preferences* of the community. In the accumulation of this information, we as a community find commonality [by measurable degree]. We refocus our awareness where necessary to determine new technical possibilities. When we share in our needs, then we may find we all equally share in our designs also.
   A. We inquire into our needs and the needs of our ecology, and we share the information.
   B. Global demand assessment is integrated in the decision system for community into the parallel inquiry space in the form of a continuous Issue Articulation Inquiry working group for identifying, surveying, and analyzing issues with human fulfillment.
3. **The Global Production and Distribution Protocols** are both a collaborative design interface (CDI) and a "convention" of trust agreements,

which form a habitat protocol on a network (of cities). Global design protocols create a platform for productive and distributive decisioning concerning changes to our habitat system. The protocols herein are encoded into the Community's decisioning system through a transparent and participatively formalized macro-calculation embedded in a parallel decision inquiry space, where solutions must value calculations done on them to support certainty in the selection of a solution meeting requirements.

A. **The Production Service Control System** is designed to optimally and scientifically engineer and manufacture solutions to socio-technical [economic] needs. The objective of the Production Management/Coordination System is accomplished through the application of three *production processes (i.e., strategies, values, operational values)*:
   1. **Strategic preservation (justice)** - maximize the preservation of resources and people, of human civilization and a healthy biosphere. This strategy involves a characteristic design protocol:
      i. Products (habitats and their sub-systems) are designed to "last" (i.e., longer usability & less maintenance).
   2. **Strategic freedom (with safety)** - minimize the damage to ourselves and our environmental habitat. This strategy involves a characteristic design protocol:
      i. Products (habitats and their sub-systems) are designed to be recyclable or decomposable.
   3. **Strategic efficiency** - increase efficiency for the mechanics of production and energy transformation itself. This strategy involves a characteristic design protocol - goods that evolve rapidly are designed to be automated, updatable, and modular so that they are adaptively responsive to individuals in the community. Herein, the "means of production", which refers to the actual tools and methods used in the production itself, are accounted for and optimized in their design as our technical capability advances. The "means of production" of anything is directly related to the state of technology and the underlying social conditions.
      i. Products (habitats and their sub-systems) are designed and operated in an optimized (technical) and intuitive (social) manner.

4. **The Global Access System** is designed around a macro-equative model (a formula or equation) that describes the flow of information and materials within each of the principle four economic sub-systems:

A. **The Resource Service Control System** exists as a series of information sensors (detectors or instruments) with the purpose of monitoring and tracking the location, consumption rates, regeneration rates, and recycling rates [within the hierarchy of decompositing/-ion systems], and hence, the probable predictive availability of access to common resources. "Resource management" is essentially the process of '**resource accounting**'. Resource accounting is the only possible way in which all of a community's common resources can be "made available to everyone". Sensors record data that may used to determine orientation (in space) and decisioning (by means of computation upon recorded and stored data to determine what actions are optimal for an intentionally set task). Resource accounting utilizes dynamic feedback from an Earth-wide/community-wide accounting system that shares data about all relevant [transactions of] resources. To whatever degree technically possible, all raw materials and related resources are traced as they move through the known systems, in as close to real-time as possible. Herein, a critical efficiency calculation for sustainability involves: (1) maintaining equilibrium with the Earth's regenerative processes; (2) maximizing the use of the most abundant materials; (3) minimizing anything with emerging scarcity. If the sharing of information is not acceptable in a society, or the medium (i.e., transport protocol) by which information is shared cannot be trusted, then it is wise to explore such a society's socio-economic system and introspect on the type of people it is likely to generate.

B. **The Material Inventory (or resource inventory)** - Material use per a given production output is strategically calculated to assure the use of the most conducive and abundant materials known. In other words, a material inventory exists (a.k.a., resource inventory) for use by a computing system that calculates the optimal transport and integration of material into the community's "materialized model", by item and by a set of factorial criteria, including but not limited to: (1) material integration durability (i.e., lifespan); (2) material recycle-ability (i.e., 'recyclability'); (3) material quantity; (4) material accessibility (temporal and spatial); and (5) material regeneration rates (i.e., abundance). Products would be designed to be both durable and recyclable, since the product's entire lifecycle would be designed by the community of users of the service themselves. Why would we cooperatively design otherwise? The criteria can be generally categorized into two different types: **conduciveness/applicability** and **abundance.** The two basic questions are: What is the "conduciveness/applicability" of this material to the projected service? And the second is, what is the material's overall state of "abundance"? Here, 'conduciveness' relates to the functionality of the proposed use of the material (i.e., how functional is the material?); and it based on the material's properties, the properties of other materials, and the identified design requirements? 'Applicability' is similar to 'conduciveness'; it refers to how relevant a particular material is to a given application. 'Abundance' refers to how much of a material is available, and hence, its rate/dynamic of regeneration (or "scarcity"). Herein, materials are compared by calculation of the available data. In other words, what occurs may be referred to as a 'synergistic efficiency comparison' between materials and their ability to fulfill requirements.

Herein, technical product[ive] objects have:

1. **Attributes:** such as lifespan, maximum size, minimum size, maximum temp, minimum temp, etc.
2. **Relations:** such as "a kind of", "is a part of", and "has parts", etc.
3. **Behavioral functions:** such as co-occurrences, becomes, evolves from, and affects.

5. **The Demand and Distribution Tracking System** tracks the populations needs and distributes goods and services in an optimal, preferential, and systematized manner. The "demand" aspect of the system is informed by the population's inquired needs (i.e., "demands"). The 'distribution' element follows a **strategic proximity strategy** that seeks the localized cradle-to-cradle usage and recycling of good /services in an effort to minimize energy expenditure and optimize sustainability. Herein, 'localization' refers to the use and regeneration of resources as close as proximity will possibly (i.e., technically) allow, which reduces the transportation requirements of resources. The distribution of goods and services occur through 'general' and 'special' *distribution centers*. A distribution center is essentially a "check-out" facility, akin to a library. 'General distribution centers' exist to distribute personal and community access goods and services of a 'non-geographic use' specific nature. 'Special distribution centers' exist in areas where certain, specialized goods are utilized (saves energy & less transport), these have a 'geographic use' specific nature.
6. **The Collaborative Design Interface (CDI)** - This interface is part of the [user] front-end of the decision system. It visualizes the collaborative demand-design dynamic of the community. The CDI could be considered the "new market", the market of ideas and designs, of needs and solutions – it is a market for sharing in, not a market for competition. If hierarchy does appear, then competition for the redesign of the system toward greater neutrality will naturally emerge for the structure facilitates such adaptation. After demand (or need), design is the first intentional step in decisioning. This interface can be engaged by a single person or by interdisciplinary teams; it may be participated in by everyone. It is a single contribution interface with a framework capable of supporting coders, designers, editors, and end users.

   The natural environment regenerates our lifeground and it gives us back information (Read: negative feedback; signals) after we have made a change.

Table 1. *Accountable operational processes for coordination and control of habitat resources.*

Access Service Control Types	Control protocols
Resource service control	Resource Accounting
Production service control	Strategic design
	Strategic preservation
	Strategic safety
	Strategic efficiency
Demand and Distribution service control	Strategic proximity

4.1 The global production and distribution service architecture

The principal architectural layers of a global production and distribution service include:

1. **Design services:** These computing systems allow for the development and sharing of workable designs. The CDI (or collaborative design interface) is an open source environment, and accompanying computing interface, that facilitates networked, computer-aided design.
2. **Production services and locations (fabrication centers):** These structures facilitate the material

manufacturing and fabrication of a given design. These are likely to evolve into automated service production centers (i.e., "automated factories") that are increasingly able to produce more with fewer material inputs and fewer machine configurations. In community, we desire to rationally and consciously overcome unnecessary design complexities, we can further this efficiency trend with an ever lower environmental impact and ever lower resource use per task, while maximizing our abundance producing potential. Over time, production facilities move toward increasingly less [cybernated] variability as they become more efficient; therein, paradigmatic re-orientations of design change the potential variability in the system by changing its map of the territory, its relational environmental perspective. Each of these facilities has a spatial location strategically planned and distributed topographically. Note that the location and operation of all production facilities also involve a "proximity strategy".

A. **Recycling facilities** and decomposition spaces exist as part of the design of the production facility. As noted in the design protocol, all goods have been pre-optimized for 'conducive recycling'. The resiliency goal here is a zero-waste economy, like nature (a "true economy"). Everything goes back to a recycling facility, likely the point of origin, which will directly reprocess any item as best it can. Of course, an item may be returned elsewhere if needed; the integrated and standardized production and recycling centers having been conceived of as a complete, compatible and holistic system, that would be able to handle returned goods optimally, which is not the case in early 21st century society.

3. **Distribution services and locations (including distribution networks, access centers, and and storage centers):** These structures facilitate the actual distribution of a given product. Distribution can occur: (1) directly from the production facility, which is usually in case with on-demand, one-off production for custom use, or (2) it may be distributed to a distribution library for access, based on regional demand interest. It is worth reiterating that regardless of whether the good is allocated to a library or immediately occupied by a user, the whole system is still an 'access system'. In other words, at any time, the user of the customized or mass produced good can return the item for reprocessing or restocking (unlike in the market, where ownership entails responsibilities).

4.1.1 Community access elements

The primary elements of community access are:

1. **Location** is based on the logical proximity of a population concentration to a need. This is best exemplified with the current practice today of (usually) placing grocery stores in average convenience about a community, and placing heavy industry away from residences.
   A. In a planned habitat, all locations are designed and planned during the design of the integrated service system, and the internal system can modify and adapt its spaces where necessary and flexible to accommodate new forms of integrations.
2. **Method of access** is best described "as ease of access". Community is a shared, distributed logistically-oriented "library" system. This isn't to imply that all items retrieved must be "returned" to what might be called "access centers", but to show that they can be for convenience. It is certainly a welcomed practice since this process of "sharing" is a powerful enabler of further access efficiency, which is shared in turn. In other words, fewer goods are needed to meet the interests of more of the population through a trusted system of sharing.
   A. In community, there is no resale value in the system since there is no money. Therefore, the idea of hoarding anything would be an inconvenience, rather than an advantage. In the state of access, we ask ourselves, "How do we want our services distributed? Do we want them distributed directly to a our self at its present spatial location, or do we want it distributed to a specific location that "enables" access?"
   B. Herein, the community's inventory system includes a design profile for every productive service known and available.
3. **Tracking and feedback** is an integral part of keeping the system, both regional and global, as fluidly distributed as possible, when it comes to not only the meeting of regional demand through adequate supply, but also keeping pace with changes in extraction, production, distribution technology and new demands. Tracking and feedback require a variety of sensor systems. Fundamentally, what can be tracked depends upon what software is available, what hardware is available, where sensors are placed, and how teams use and respond to the data.
   A. The global resource management architecture maintains a sensor and measurement system that provides feedback and information about the current state of resources and

the environment, in general. This sensor network may be divided by spatial location, the [method of] access to the protocol itself, as well as the ability to audit [information packet] transactions, and correct for feedback.

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Decisioning in a Community-Type Society

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Abstract

It is likely that a community-type society would model and visualize its decision system in order to ensure an understandable and verifiable outcome. The decisioning process of a society can be described and modeled. The useful result of modeling is a decision support system by which decisions are algorithmically processed for some decisioning entity. Once there is realization of decisioning, there may emerge realization of decision support. There are decision support technologies, including computational and storage systems. By understanding what a decision is, it is possible to configure a decision system so that it embeds cleanly in an adaptive societal system. If decisions are not well understood, then behaviors are unlikely to be well understood. A societal decision system involves logic that integrates values, issues, and knowledge into decided solutions that are executed in the material domain.

Graphical Abstract

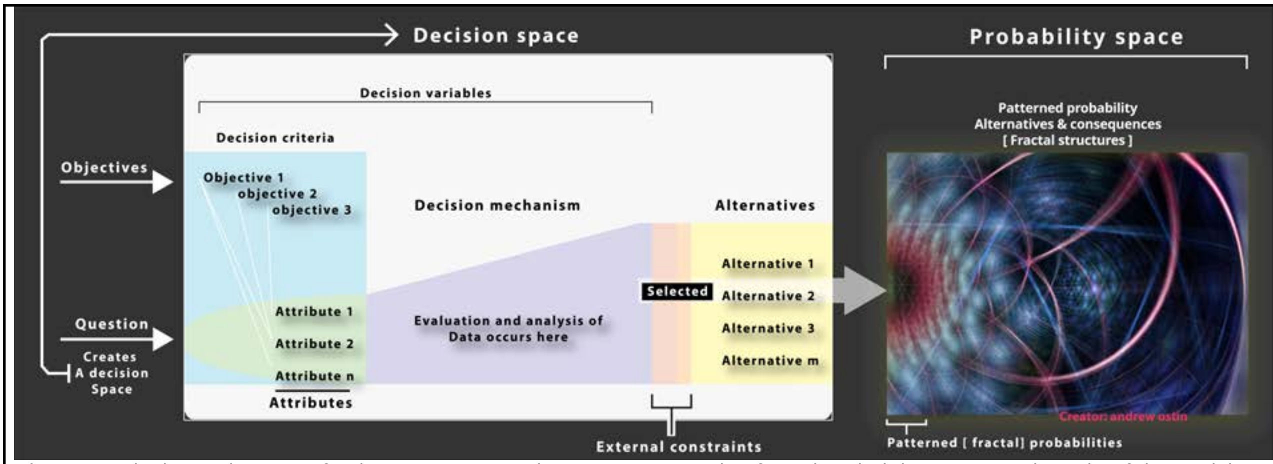

Figure 5. *The basic elements of a decision space (or decision system) with a fractal probability space on the right of the model. Here, a decision environment is resolved through the selection of one of several alternative solutions after the use of a method has been applied to integrate all relevant information and produce the alternatives.*

1 The classification of the decision [support] service system

The decision system for a community-type society may be sub-classified in four primary ways. A decision system at the level of resources is an economic system, and at the level of the user it is an access system. However, before a community-type societal system can usefully encode the concepts of access and economics, it must first apply the fundamental methodology from the social system, the systems approach. The decision system for a community-type society is a systems-based model; it is also an access-based model, a resource-based model, and a participatory-based model. These are the decision system's primary economic classification types. The decision system is a system's based system, because it accounts, systematically, for all societal-level (or, societal-significant) decisions. The outputs of decisions of the societal system are accessible by users. The outputs of decisions reshape the material and informational environment, and in doing so, resources are moved and transitioned. In order for a community-type society to function, the individuals therein must participate in the system's sustained operation. Contribution optimizes demands in a social resource environment.

> **IMPORTANT:** *The built environment in community, because it uses common heritage resources and impacts both local and global fulfillment, must be planned at an appropriate scale of periodicity (cycle). In community, the built environment is the product of master-planning on a cyclical basis, with appropriate flexibility between.*

Economic decision models may be classified by the [architectural] function(s) they serve. The decision system model herein functions to provide a community population with access to common resources while operating a habitat service system based upon servicing the needs of individuals as they expend effort toward their higher potentials. Herein, humans have a need for common heritage resources to be transformed into accessible goods and services through contribution to a systems-based approach. Decisioning becomes transparent, coherent, and accountable. It involves participation and conveys confidence and trust to the population.

> **QUESTIONS:** *What do decisions look like at the individual and societal scale when the market-State is taken entirely out of the decision? What modes of organization, coordination, and decisioning will be most effective for human need fulfillment under the value conditions of community?*

The model may be classified (categorized) in four principal ways:

1. **Systems-based model** - Essentially, the model is a "true" systems-based model as it applies technical system's principles to inform the programmatically systematic method it uses to arrive at, or "framework", economic decisions toward the engineered fulfillment of human needs. It models systems dynamics and is systematically adaptable; it is solutions-based. A solutions-based system presumes the answer to a problem is possible, and that a platform is needed for its discovery from an existent environment that may be experienced with some degree of [navigational] accuracy. In its functional role as a systems-based economic model for human fulfillment, the decision system may also be referred to as a *needs-based model*, because living systems have needs, they have requirements for living, and specific requirements for living well. Here, the systems-level of decisioning in society, there is an InterSystem [societal team] coordination for actual economic coordination of common heritage resources through habitat services under a single planetary ecology.
   A. The economic decision system is structured from a 'systems' perspective, and following systems-based principles and practices.
      1. There is decisioning about the acquisition and transformation of resources into needed goods and services in local resident customized habitats.
   B. The model provides a systems-based function.
      1. Societal information-intelligence standard.
         i. The overview of the [societal] system.
         ii. The project plan for the vision and execution of the transition to, and operation of, the vision.
            1. The social system standard.
            2. The societal information standard.
               a. The textual part.
               b. The 2D concept-model ('figure') part.
               c. The 3D object-model ('object') part.
               d. The 4D simulation-model ('action') part.
            3. The societal surveyors.
               a. Societal data collections and analysis.
         iii. The decision system standard.
            1. Decision working groups.
               a. Global resource planning protocols.
               b. Local aesthetic and functional master planning by residents.
               c. Local agreement to behavioral standards as conveyed in a set of "signed" by-law agreements.
         iv. The material system standard.
            1. The habitat service systems (and habitat

service team members).
      2. The habitat operational manuals (the team members' knowledge).
   v. The lifestyle system standard.
2. Decision system-user agreement protocol to develop local and global economic master-plans.
   i. Users residing in local habitats have needs and expectations for aesthetic and functional operation of their local habitat. The user has habitat-level aesthetic customization design decision influence, and legal-level behavioral agreement of consent to reside in the local habitat.
      1. Have a permanent residence in community, wherein a personal resident in community goes through four phases of life):
         a. Nurturing.
         b. Educating.
         c. Contributing.
         d. Leisuring.
      2. As a visitor (i.e., permanent resident in community and visitor to a local habitat not one's own). A visitor is a community resident visiting a dwelling-like sleep and personal-storage location other than their local personal-habitat dwelling.
         a. Visitors: may be of any of the life-phase categories: nurtured (young, or visiting family), educated, do contribution, and leisure.
      3. A local permanent resident "resides" is the location where the user has domain over as a 'personal space', per agreement to the local habitat by-law set of agreements.
3. Habitat service system operations for local life-service, technology-service, and exploratory-service fulfillment.
   i. Users have local socio-technical needs and expected habitat services throughout life[-phases].
2. **Access-based model** - The term 'economy' is not uni-dimensional, uni-conceptual or uni-factorial. Hence, an economy is not just capitalism or socialism. To claim that it is would be a bit disingenuous; and to believe that it is would mean buying into a conditioned illusory reality that is not systematically open to a greater commonly verifiable experience. Instead of polarity, it may be easier to think of the socio-economic system herein as a complex interplay of applied conceptualizations and dynamic processes, which form an access system of some type (the type that allows embodied consciousness to access common material resources in abundance). There are many forms of access, and hence, many types (or classifications) of access system.
   A. The [economic] decision system accounts for access.
   B. The model provides an access-based function.
3. **Resource-based model** - A resource-based economy is one type of access system. It is an access system that caretakes (or stewards) and accounts for a common resource pool while providing access fulfillment to economic needs without exchange (i.e., without the market) in an optimized technical manner forming [at scale] into an integrated city-living habitat environment.
   A. The [economic] decision system accounts for resource.
   B. The model provides a resource-based function.
4. **Participatory-based model (contributory-**

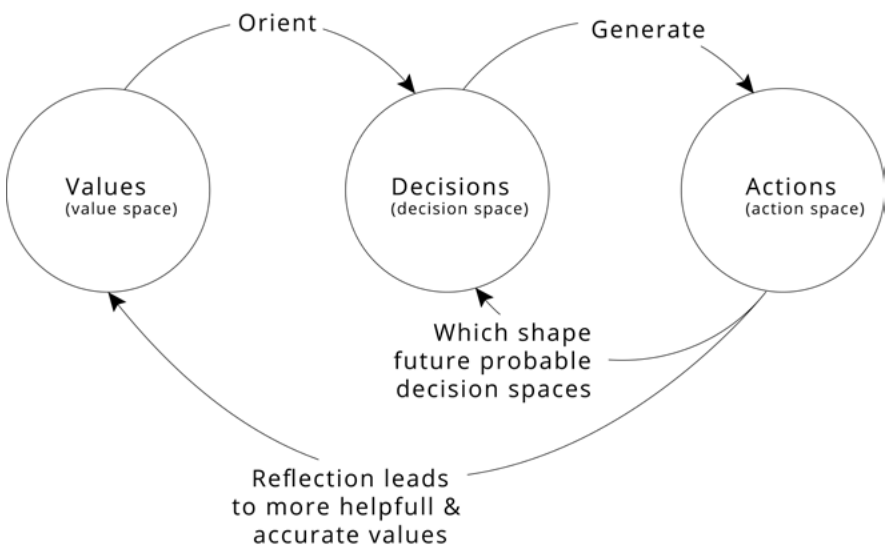

Figure 6. *Values orient a decision space for more accurately predicting future probable spaces, by means of actions generated as a result of decisions. Actions lead to different future probabilities, and reflections upon action may update values.*

based model) - Participation means two things. First, it means willing-intentional participation in decisioning and production. In the context of production, it means that the model is organized around human contribution to standards, decisions, and production. In the context of personal dwelling work, it means contribution to the work that sustains the local family and its dwelling space. Participation also means participation in society as a user -- following personal- and common-access user protocols/agreements. In the context of user decisioning, it means participating in necessary decision inquiries (e.g., maintaining a habitat profile, completing consumer/user surveys, articulating issues with informational and material systems, etc.). Participation is necessary for the continuation of any common material system. A resource-based economy is a voluntary (or volitional) participation/contribution model. Herein, the decision system is designed to transparently account for the existence or non-existence of participation in the system by which economic needs are fulfilled. This is a direct, participatory economic system, more precisely it a direct contribution-by-user economic system). There is participation in the form of contribution and in the form of human need and preference accounting.
   A. The [economic] decision system accounts for participation.
   B. The model provides a contribution-based function.

This economic decision system is designed to "do away with" all forms of politics and political systems of thinking, all forms of market economics, and all State (governmental) control; it is not a game of persuasion, ownership, or coercion. It involves a different conceptual set of understandings. These understandings form a type of economy that behaves like a holistic unit to materialize mutually beneficial and optimized fulfillment for everyone with consideration given to the environment in which the materialization is occurring. Herein, if problems exist, then they exist to challenge everyone to develop a comprehensive solution without reducing anyone's fulfillment in the process.

Summarily, decisioning is:

1. Systematic in concern to looking at the real-world, sharing data, and designing socio-technical systems in a systematic manner; which, conveys many benefits to human freedom, restorative and distributive justice, and efficiency.
2. Based on resources (Read: resource accounting), because all activity in the material environment (e.g., a real-world habitat service system) requires resources.
3. Based on access to a material service environment through master planned and selected proposals for habitats in a network.
4. Based on participation within two domains of life:
   A. Personal and common user access.
   B. Contribution Team Access via the InterSystem team.

In order to create a workable and optimized economy, the economic development must:

1. Model and simulate [the economy]: Mathematical modeling and simulation techniques are utilized to understand and predict the behavior of production systems, analyze resource utilization, and optimize internal processes.
2. Control [the economy]: In scenarios where precise control of production processes is necessary, mathematical tools are applied to design controllers, regulate system behavior, and ensure stability in production systems.

3. The document "Auravana Project - Decision System" presents an exhaustive overview of the decision-making framework within a community-oriented society, emphasizing a systems-based approach to economic decision-making, societal stability, and environmental sustainability. It is structured around several key components: the conceptualization of decisions within societal contexts, decision modeling for societal stability, economic decision systems emphasizing various economic models, and the implications of decision-making on community structures and societal interactions. Additionally, it delves into global parallel decision resolution inquiry, solution inquiry accounting, and extensive accounts on need and preference, access, technology, resource, and environmental inquiries.

Decisioning in community is a holistic and integrative approach to living together in society, focusing on the optimization of decision spaces, acceptance of change, rational decision modeling, and the impact of socio-technical systems on decisioning processes. The decision system is a comprehensive economic decision system that includes linear and circular economies, socio-economic planning, and the macro-economic structure of habitats, aiming for societal sustainability and the minimization of environmental impacts, while meeting the global optimal fulfillment needs of the population.

2 A systems-based economic [decisioning] model

CLARIFICATION: *The decision system is based on the language of systems in order to understand and decide problems systematically.*

Systems-based models recognize and adhere to systems principles (systems dynamics) in the application of effort. Herein, the system [dynamic] is seen as the source of its own problems, which allows for a volitionally iterative design orientation (e.g., intrinsic motivation). From the perspective of understanding the underlying causations to problems in our fulfillment it is imperative to examine the problems more closely. Because, if we do not understand the causations to the problems we cannot hope to solve them. Similarly, if the structure of a difficult problem is not understood, then the problem cannot be solved. By applying principles from societal systems science, planners and policymakers can design and operate habitat systems that align with the values of freedom, justice, efficiency, and sustainability, ultimately fostering a livable and resilient community network of habitats. Societal systems science plays a crucial role in understanding the complex interplay between human behavior, societal structures, and the built [material] environment in creating sustainable human need fulfillment systems. By employing a unifying and integrating approach, it is possible to analyze and optimize the intricate relationships among urban design, social dynamics, and environmental constraining factors.

Like every important model in community, this economic model is a systems-based model, and it involves multiple different inputs, processes, and outputs, multiple entities, linkages, and boundaries. It is a system whose inputs include data relevant to issues, needs, and decisions. Its outputs involve, though are not limited to: the allocation of socio-technical resources toward the access of goods and services in the form of operative habitat designs.

This economic decision model is understood through its relation to the larger model (or system) of which it is a part, the real-world community information systems model. In the material system of the model, there are a network of socio-technical habitats in which people live. The word habitat is just a synonym for city, village, etc. Each habitat is customized to the preferences of those people living in that habitat. It is developed and operated through master plans, and those master plans are changed every set number of years as specified in the residency agreements for that habitat. In community, there are needs and preferences; there are no wants (as there are in the market-State). The market-State is the name of the type of society we are living in now. The type of future society I am describing here is technically called a community-type society, or a community-type configuration of society. Habitats in community are necessarily open source creations and operations, so residents and decision working groups can take informed and optimized decisions.

Every systems-based approach requires a recognition of the recurring patterns of relationships (i.e., intuitive thinking) within and between systems. A systems approach necessitates a perspective that accounts for the overall architectural structure, patterns and cycles in a system rather than seeing only specific events in the system in isolation. This leads to issue resolutions (as solution orientations) that account for problems throughout the system, while recognizing the interaction between a particular system and its environment.

A system is classified as robust when it does not oscillate between conservatism and fire-fighting. A functioning system must have a way of knowing if it is neglecting information, it must be open and accept feedback. A system is negligent (or “ignoring”) when it is excluding information necessary for its most effective operation.

The decision system is a system that recognizes that there exist technical systems principles that when integrated into an encodable system, maintain the potential for an adaptive, optimal and regenerative state of fulfillment - a system capable of fulfilling our highest potential needs.

All systems are composed of individual parts. Something arranges the parts into a structure (a “constructor”). The structure determines the behavior of the system. *System analysis* is a matter of identifying the relevant structure of the system and its most important parts. From that knowledge consciousness may

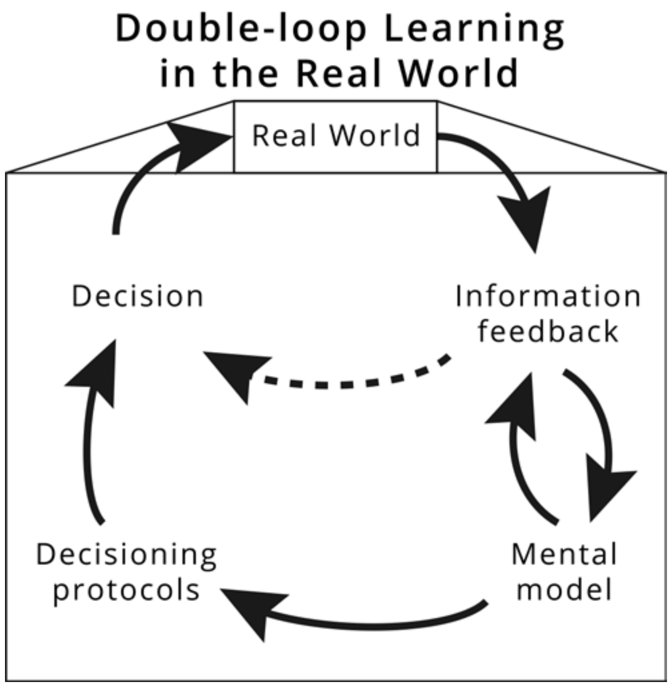

Figure 7. *Rational double-loop learning applied to decisioning in the real world in order to feed back information to improve the whole system.*

synthesize an understanding of the system's generative behaviors (i.e., the behaviors it is likely to generate in a consciousness experiencing it). Fundamentally, we know the system by the [behavioral] results it produces.

The idea of an emergent behavior concerns the arrangement of the parts, and not just the parts themselves. The chemicals in the human body can be purchased. Buying them and mixing them up in a bucket would not create a person. It is structure that makes all the difference. It is important to know how an environment is structured if its emergent behaviors are to have some degree of [design] predictability. The concept of emergent behavior is crucially important in solving systemic sustainability problems, for it is in fact emergent behaviors that drive such problems. The structure of the system as a whole must be examined if root causes are to be understood and the community's orientation redefined toward states of greater fulfillment and sustainability.

At the core of the concept of 'systems thinking' is the concept that the behavior of a system is an emergent property of its structure, not its parts. Thus, problem-symptoms are emergent behaviors. Each behavioral symptom can be traced to particular aspects of the structure. It follows that if someone does not know the structure of a complex social issue or system problem, then they will be unable to re-solve the root problem. Hence, a community with a solution orientation seeks to understand the root source(s) that generate the manifestation of a particular set of materialized behaviors.

The purpose of a system is what it does. If a system produces war, then it is structured to do so. People may imagine that the system they live under, their society, has not been designed to produce conflict and competition and violence, but if that is the result, then their imaginings are just that, imaginings. People can imagine what they like, their imaginations do not have to accord in any way with the reality and behavioral consequences of the societal structure that they live within [and may have been conditioned to accept and believe to be different than that which it actually is].

The consequences of the system are just that, the consequences of the system; the consequences cannot be said to arise "just because we are not doing it right" (i.e., are not doing democracy, government, and the market right). If we are to understand the world around us, then we need to cut through (i.e., discern) the nonsense and propaganda that is used to describe any system. The sense of offense that one might feel over this stated understanding is in fact the system reinforcing itself -- a system that lacks a mechanism for corrective feedback. Once the non-corrective paradigm of thought has been integrated into someone's thinking processes, then those too will lack corrective feedback, which maintains the establishment of a self-reinforcing paradigm of thought based on limitation.

Information in an optimized economic system is radically distributed wherein computation, storage, and communications capacity are "in the hands" of practically every connected person sharing in the community. In truth, these are the basic "capital needs" necessary for producing the persistence of community - common access to information organization generates an **information economy**. In an open-source community all important activities concerning the core [information] economy are in the hands of the population; not only *content* and *process*, but *relevance* also. An information economy has the potential to become one emergently discovered and applied system. In an information-based society, the decisions taken are based upon the information available.

In a system, a 'governing mechanism' (or 'governing dynamic mechanism') coordinates the flow of resources through the system by means of access to correctable fed-back information from an environment. In a system, the idea of 'governing' refers to the re-formalized modulation of the dynamics of the system to meet the objective(s) of the system itself.

Fundamentally, systems-based decisioning involves the following three elements:

1. **Systems have dynamics.** Systems have processes that may be active or inactive.
2. **Systems have preferential outcomes** (objectives or goals), which are regulated to some degree by the dynamics of the system. In other words, there are outcomes that the system would like to see expressed and the system maintains processes to facilitate its desired outcomes. In the case of competing market entities, the outcome the entities would like to see expressed is profit. In the case of a corporation, the desired outcome is profit maximization. In the case of an entity that monopolizes power (i.e., a government), the outcome is social control. In the case of the Community it is human fulfillment and well-being.
3. **Systems have a decision space** with decision variables, which are the choices that the entity (or system) has to make (or can probabilistically arrive at). For example, in the case of a business a basic variable is that of hiring and firing labor. A rational system wants to make these choices in such a way that the result is the maximization of its purpose, goals, and values. In the case of a business, the purpose is to make money -- the fundamental and direct purpose of a business is to make money. If you ask a business owner, "If you don't make money, what will happen?" The business owner will tell you, "I will go out of business". If you ask a business owner, "Would you like to make more money, while maintaining the value set and quality of product you currently maintain?" A rational business owner is more than likely going to say,

> "Yes, of course; that which will allow a business to survive is that which will make the most profit."
> To survive a business must look out for its own interests. Therefore, logically speaking, business doesn't want people to know when their products cause bad outcomes because that would be "bad for business". Rationality will create corrupt incentives within a corrupted decision space.

An economic system based on systems principles will adapt itself based on evidence. If humanity wants different outcomes from a situation, humanity has to change the system that underpins the situation in such a way that it delivers different outputs.

If you know the dynamics of a system and you can build a simulator for it, then all you have to do [conceptually] for all the different possible actions you can take, is to model them out (or 'simulate' them) and see which ones are more likely to lead to the goals which you want. Essentially, simulation leads to better modeling, understanding, and performance, as well as more precise engineering solutions, and in general, more rationally decisive action [through visual analysis and logical feedback]. Fundamentally, an integrated simulation leads to better design solutions. Also, a visual display of the different components in the simulation leads to better communication between all the people involved.

At the community level it is unwise to deal with the parts of a situation in isolation; we ought to handle them

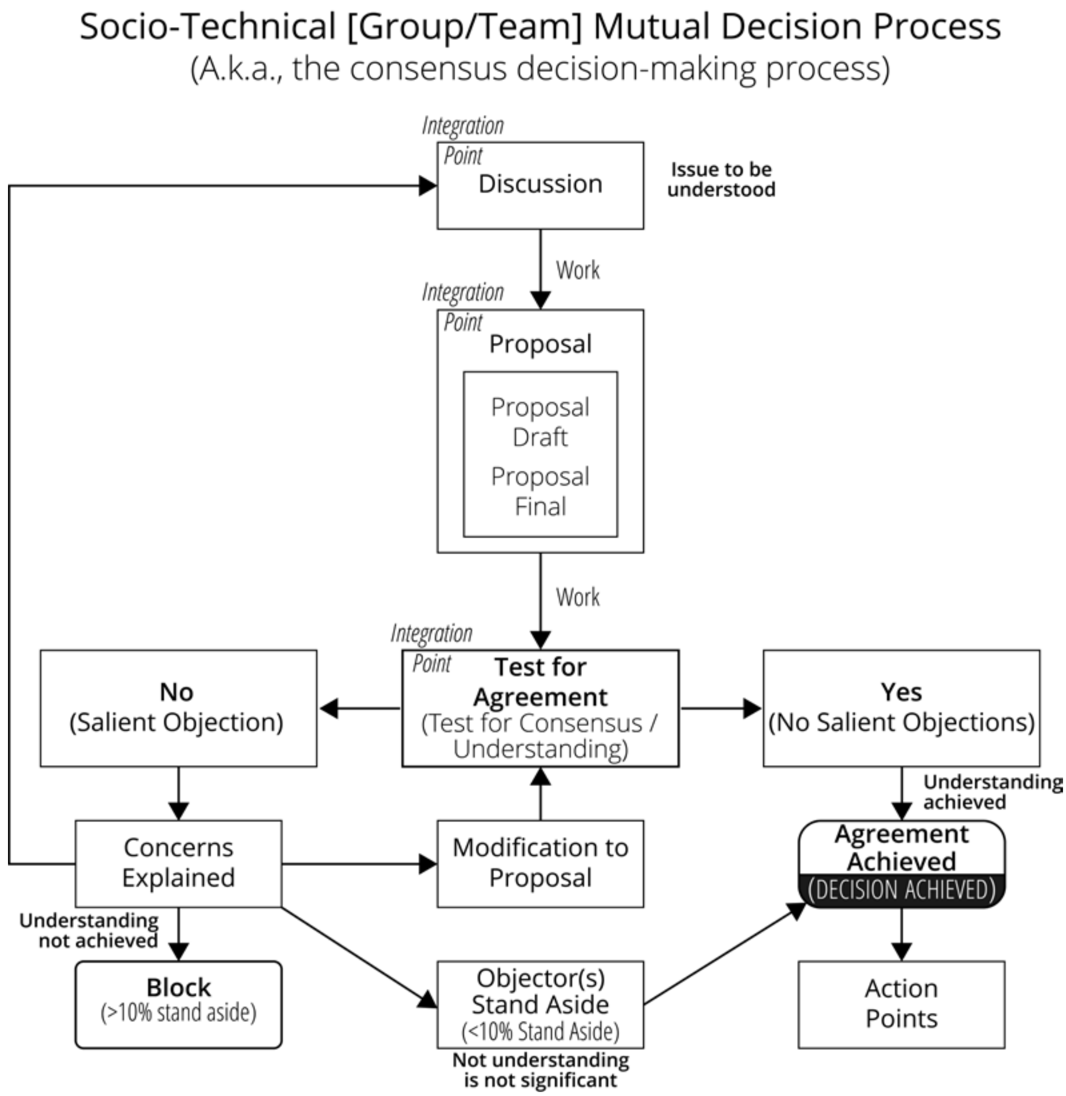

Figure 8. *Flow diagram depicting the mutual decisioning process that occurs in most team settings under community-type societal conditions. Team discuss issues. Teams propose information. Teams integrate information together. Teams test/question each other for consent, agreement, and understanding. Team members may or may not have objections. Proposals may be modified once concerns are explained. Actions are based upon achieved and agreed decisions.*

in concert. We have to deal with both the elements of a situation and how they interact with one another -- we can simulate their synthesis.

This decision system could be named a "deterministic system" because an individual with sufficient knowledge about the operation of the system, its inputs and processes, could determine to some "certain" degree the outcomes and outputs of the system. In a "deterministic system", if starting conditions are known in enough detail, then the outcomes of events from the system can be predicted [by variable degree]. Technically engineered systems are deterministic systems. They are deterministically designed through systematic organization and structuring of cause and effect. It is relevant to note herein that the concept of a "deterministic system" should not be confused with the belief system known as "determinism". Instead, all engineered systems are intentionally determined systems (i.e., deterministic systems).

The five systems principles for a stable economy include, but are not limited to:

1. The economy serves the individuals in a community; the individual does not serve the economy.
2. Development is about the individual and the social, and not about objects.
3. Growth is not the same as development, and development does not necessarily require [economic] growth. Growth is a quantitative acquisition. Every living system in nature grows up to a certain point, and then stops growing; but we (individuals) continue developing ourselves. Development has no limits; growth has limits.
4. No economy is possible in the absence of ecosystem services.
5. The economy is a subsystem of a larger finite system, the biosphere; hence, infinite growth is impossible.

Donella Meadows (2013) observed:

> *"To a systems thinker, it is just crazy to talk about tradeoffs between the economy and the environment. It's just even a thinkable thing, because the economy and the environment are so clearly one integrated system. It is surprising, once you really get into systems, how often you hear people talking about trading off one part of a system with another, when you see very clearly that there is an assumed reductionism, separation between parts of the system, that just aren't so in the real world.*

To effect real/actual system change (i.e., systemic change), the function or purpose of the system itself must be changed. The following system components determine a system's behavior and identify where to intervene (Meadows, 2013):

1. **Function** or **purpose** - The function/purpose fundamentally determines a systems behaviors. Note that a system may not be able to achieve its function/or purpose. If it can, the system will do what it is set up to do. To fundamentally change a system, this must be changed.
2. **Interconnections, relationships** - In other words, the structure, processes, feedbacks. and information flows. The behavior of a system can often be changed significantly just by changing the way information flows within it, or what information is available.
3. **Elements** - A change to elements is a low-level way of changing a system. Rarely, if nothing has changed above will a change here make a difference. Occasionally, however, a change here could affect the above components of a system, which will have a more significant impact on changing the system.
4. **Behaviors** - Everything above produces (given an environment) the behavior of a system. Simplistically, behaviors are general effect tendencies of a system over time.
5. **Events** - If the system is frozen at any point in time, it will be observed to be doing something, which is an event. Events are isolated "snippets" of the behavior of a system.

> **INSIGHT:** *There is no need to hoard; humanity can organize and share. There is no need to consume infinitely; humanity can prioritize and reach fulfillment.*

2.1 Cybernetics

Cybernetics is commonly considered a science concerned with the study of systems of any nature that are capable of receiving, storing and processing information so as to use it for control. In other words, it is the science of effective organization. To be effective there must be information about and control over systems. (Beer, 1979) Hence, cybernetics appears to provide a sound framework for organizing information and control in the economic problem domain.

In some sense, cybernetics is the application of systems science using complex machines. Therein, there are at least two ways to view "variety [of access]". First, "variety [of access]" in the market, where goods and services are traded in competition and scarcity. And secondly, "variety [of access]" in the sense of how systems scientists (e.g., Stafford Beer, Norbert Weiner, etc.) in cybernetics define the term "variety [of access]". In the market, variety refers to choice, such as the variety of coffee that someone can buy, or the variety of services that can be found; in this case, it is a euphemism for competition. Cybernetic's has a different definition of variety [of access]. In cybernetics, variety refers to the number of possible states of the [material and/or informational] system. Variety is a loosely defined as the number of different states ("status") a system can be in. In a cybernetic sense, different system states produce different types (quantities and qualities) of access (to habitat services). For example, a standard traffic light (or stop light) has three normal states: red; yellow; and green states. It has four states if there is an additional state where there is no colors displayed (state = off"). This is the systems 'variety'. If a driver approaches an intersection with a traffic light and wants to proceed through the intersection safely, then the driver must distinguish (or otherwise, understand) each of the different states of the traffic light system; otherwise the driver will not have control of [a decision space in] the situation, and the likelihood of an accident increases. The number of different states (or 'behaviors') of a complex dynamic system can be extremely large (e.g., the global climate). Community has variety, both in the sense of states of the social and technical systems, as well as a preference [inquiry] in the decision system for particular states of the material environment. Cybernetics offers a systems-based conceptual frameworks for understanding and improving design processes, and thus, their outcomes.

Based on the principles of communication and control, cybernetics can inform design [decisions] on at least three levels:

1. Modeling interaction: human-human; human-machine; or machine-machine.
2. Modeling the larger service systems in which much interaction takes place.
3. Modeling the design process itself.

In a cybernetic economic network, data would be automatically collected, reviewed, evaluated and used to calculate dynamic action plans meant to solve human economic problems and change the societal system's environment. These action plans may be calculated through computing systems and visualized for human understanding into intelligible graphs, figures and other forms.

Herein, cybernetic decisioning implies the use of environmental feedback loops to adapt new actions to the input, integration, and valuing/re-orientation of the results of prior actions.

When the individuals among a societal population (i.e., persons within the collective) can relate performed actions to their consequences on the overall system condition, then they are able to 'learn', by means of action-impact-integration triad chains. During subsequent decisioning processes individuals may adapt by using this earlier integration of information to re-evaluate actions' utilities (priorities and processes/activities) differently than before. Herein, certain activities can increase current and future fulfillment, and certain actions can hinder current and future fulfillment, of some user's set requirement of the cybernetic system. Given the information available, individuals can come together to form a model and algorithm that identifies mutual and optimal paths for fulfillment, computationally.

2.2 Habitat master decision planning service

A.k.a., Habitat master plan decisioning.

Community develops a comprehensive economic habitat service system plan (locally customized and globally common) that is oriented toward what the population needs (and prefers). And, what the population needs at a material level is: life support, technology support, and exploratory support, with life support ranked (ordered) as the priority access. Products produced and consumed in the economy have use (to the population) in these three need (for service) support categories. In community, decisioning concerning economic resource allocation is based on priority from emergencies to continuously operating as nominal [HSS team] services, to the strategic decisioning and planning of future services in the form of habitat socio-technical master plans. All habitat socio-technical plans account for

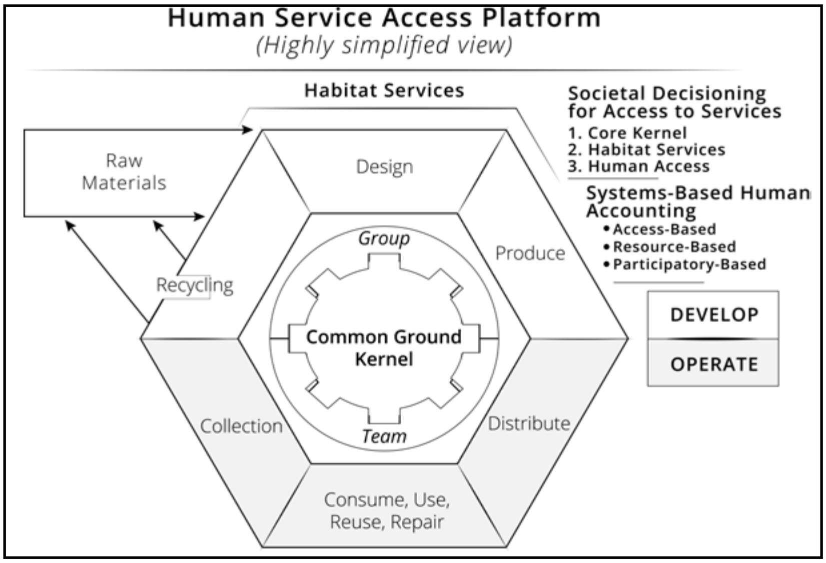

Figure 9. *A common kernel is designed and operated in order to solve for the optimal production of a life-cycling habitat service platform for humanity, developed and sustained by a working team.*

global resources and are customized to a local habitat residents and a local habitat region. All types of habitat are organized based on three primary service support systems that every habitat has as basic [human need fulfillment] operations: life-support, technology-support, and exploratory-support. All types of habitats are also sub-organized based on three primary operational processes: incident response, operations continuity, and strategic planning.

Changes to an adaptive societal system must be planned for, must be standardized, and new systems need to reflect more accurate models and up-to-date information. Hence, planning must be done in the presence of the whole. When it is done in isolation from the rest of the environment (from ecological concern and human interest) we cannot effectively prepare the next iteration of our habitat service system for the fulfillment of the whole of the community. Herein, planning is an element of any systems model that seeks to account for resource usage under conditions of technical economic efficiency. In other words, whatever planning we do, we must have the resources. As models evolve, so too do plans. All coordinated systems plan the allocation of their resources. Fundamental societal systems planning means to view society as an operational project that forms habitat services as planned.

A failure to plan for the future is a failure to plan for our own survival. We need a healthy environment to survive and we need a healthy mind in order to survive in our environment. This is the basis of logic as a tool which predicates human survival. What would happen if our ability to effectively plan for the future were undermined? We would have what we have here today in early 21st century society; a failure to facilitate community. A community needs intellectual fortitude to face uncertainty and wring from it the drops of knowledge which lead to understanding of its designs.

The decision system is part of a structure that is collaborative at the "global" systems level, at the level of the Habitat and larger ecology.

The degree to which individuals in a community have to plan their access (i.e., "consumption" - market economy term) depends upon a variety of factors, including but not limited to resource availability, technological capability, the prioritization and trending of particular needs, capacity and regeneration rates, and anticipatory emergency incidents.

And, it is interesting to note that planning [contextually] reduces the likelihood of decision fatigue (i.e., willpower fatigue) because the decisions are already made.

Each habitat service system maintains an integrated strategic plan to provide for the functional needs of the community and maintain alignment with the community's value system over time (i.e., temporally). In essence, a plan is simply a "next" iterative design (or iteration) of the total habitat service support system design.

Herein, planning is systematically organized (i.e., central and de-central; it is distributed) by an ecological habitat service system. At the habitat service system-level, planning occurs centrally to the habitat service system. The habitat service systems maintain interrelated strategic plans to ensure the continued fulfillment of human needs through dynamic design. There are plans, but there is also voluntary participation in the planning environment. Humankind's social and economic systems are not an exception to interdisciplinary ecological design.

There are many elements of early 21st century society that are planned, and that fact is not considered controversial. The existence of businesses, which plan their activities, demonstrates that so called "free market economies" are to a significant extent planned [in a hierarchical and industrially centralized manner (i.e., top-down vs. parallel planning)]. Who would argue for an unplanned rail or communications system? Who would argue for the unplanned design of a commercial electronic good? Who would argue that service-distribution requires planning? Who in their professional life does not work to a plan as a business plan or something similar? Who does not plan their travel? Who does not plan a design improvement or the modification of any system? Is city planning wrong in principle? What type of organization or system would take action without planning? Planning is essential for all organized effort toward a common objective, or purpose. It seems that we plan everything even remotely serious in our lives, or at least accept that we ought to plan for those things, but for some reason we draw the line at planning how we sustainably live on this finite planet and in our communities.

In every society, some actions are planned and others are not. Intrinsic spontaneity can be a joyful personal experience, but to base the organization of a society on it is folly. Fundamentally, it is rational to plan for the fulfillment of a community, and to not do so is likely to create anxiety, harmful levels of uncertainty and stress in the community, such that irrational actions are of a greater certainty. Chronic states of stress degrade optimal decisioning and interpersonal trust by provoking reactive (or "irrational") emotional responses -- they de-construct community.

It is true that personal spontaneity and future uncertainty can lead to emotional excitement; however, it is unwise for a community to maintain an economy based upon spontaneity and a high degree of uncertainty. The emotional excitement that stems from personally chosen spontaneity has the potential to add to the joy that someone experiences in their life, but when this emotional excitement comes at the expense of more primal fulfillment because the economic services and products are not planned for, then the community has a serious need/value prioritization issue on its hands.

Also, a functional system must maintain an adaptive feedback mechanism (i.e., a learning mechanism). When learning does not occur, plans do not improve and adaptation does not persist. When adaptation ceases, then 'self-preservation potential' decreases.

The acquisition of new and relevant information must be allowed to evolve and update any existent plans -- information transparency and sharing is salient. When a community forsakes planning, then it is essentially forsaking the concept of organized and coordinated effort toward a purpose. A failure to plan for the future is a failure to plan for our own survival.

Planning is necessary to ensure the strategic preservation of our community and our common heritage resources (i.e., a common pool of resources; resources that are commonly unowned). The preservation of resources is part of a larger community strategic preservation strategy for each of the habitats' systems. Such a preservation strategy is the opposite of the modern day profit strategy known as "planned obsolescence".

> **INSIGHT:** *If you have a plan in life, and you are using someone else's energy to accomplish it, then it is not a plan, it is a problem. Our goal should be to create our masterpiece (our self potential) from our passions and our efforts, which is a potential that nature provides.*

2.2.1 Habitat network operational processes, local and global

In community, there are both local [habitat] and global [habitat] network processes active simultaneously. Hence, there would need to be some unified information system for organizing all information available on the network. Local habitats provide physicalized services via habitat service teams who use common heritage resources and a community coordination structure. There is also a global network of available information, and physical resources and technologies (including computational, electrical, etc.). Hence, there is an accounting for needs, requirements, resources, and information at both the global and local scales. The local scale is the immediate interface, the habitat service platform, that provides physicality to fulfillment. At the global scale is a network of objects and processes coordinated into a configuration that meets global human need fulfillment requirements.

Hence, the habitat system includes the following 2 (by 2) elements:

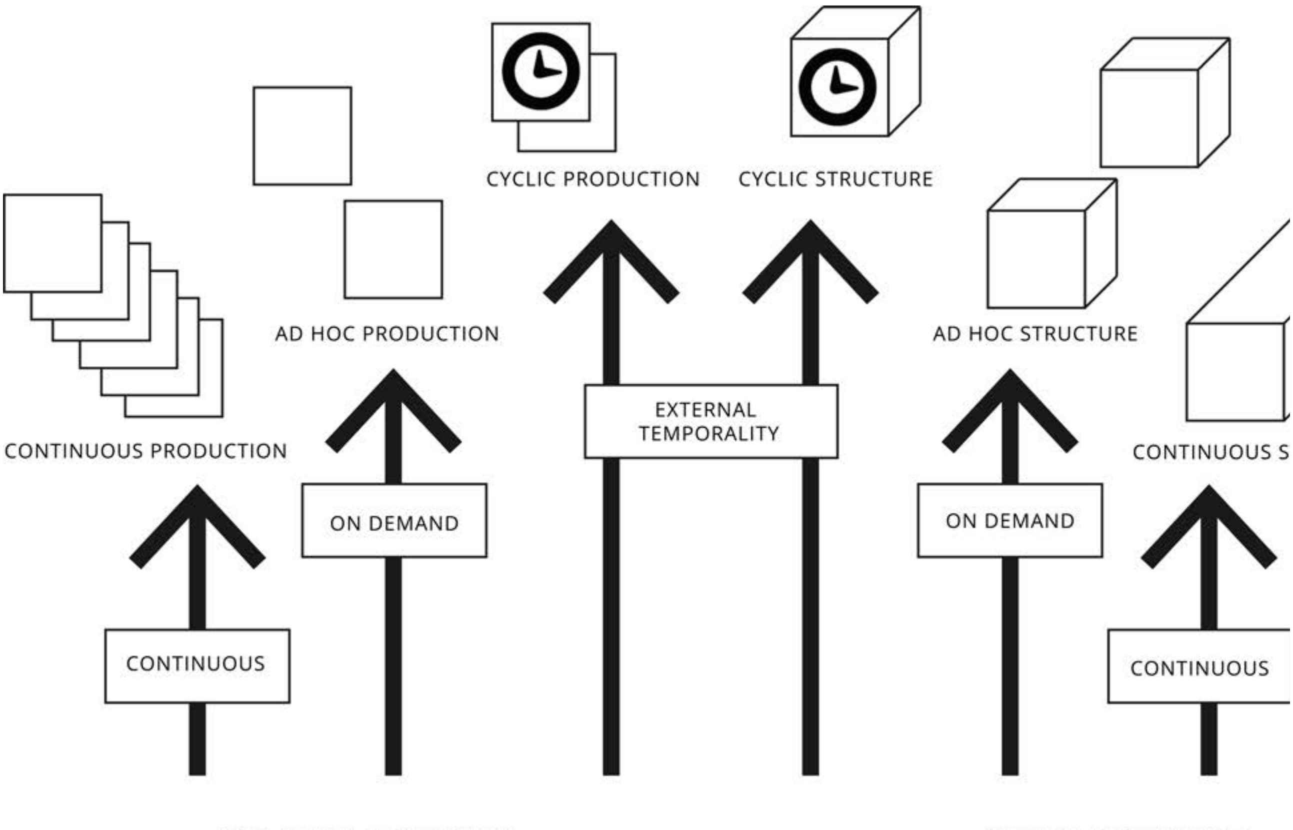

Figure 10. *Production and structure visualization. There are objects that are produced on some time-frame basis. Objects can be produced as individual items on a continuous, on demand, or on some cyclical, basis. Objects that become permanent (Read: continuous) structures within an environment can be produced/sustained continuously, on demand, or on some cyclical basis. Often, individual item objects that are produced via some service are used either used immediately (e.g., fresh food), held in a physical/ digital library/catalogue repository, or held for some later pre-scheduled event in a repository. A repository (library) is a continuous structure.*

1. Local physical habitats as platforms for habitat service operations (processes). The local physical habitats combine into a physical habitat service system network. Herein, the local habitat systems exist because of an informational [resource] base.
2. A global information system about, and for use with, habitats. Herein, the global information system exists because of a physical [resource] base.

2.2.2 Habitat network conditions

The construction of systems in the real-world can be oriented toward specific value states, conditions and objectives. The resolution of decisions in a principled manner ensures social navigation together is possible:

1. **Objective 1: Open by default.**
    A. Use of freely accessible open data has significant contributor (social and economic) value; data should be open and transparent by default, unless there are safety concerns.
        1. Open data improves transparency of decisioning and the community's trust.
2. **Objective 2: Timely and comprehensive.**
    A. Data is valuable only if relevant to its users.
    B. Data should be accessible to its users.
    C. Data should be provided as accurate, comprehensive, and "high" quality (and/or carry a certainty value with linguistic reasoning).
3. **Objective 3: Unified integration of system (comparable and interoperable).**
    A. The potential effectiveness and usefulness of datasets increases with improved quality (integration and certainty), easing comparison within and between similar sets over time, aided by compliance to a common data standards.

2.2.3 Uncertainty

> **INSIGHT:** *Individuals in a community do not necessarily seek to systematizing life or freedom, but instead systematize humankind's support structure so that everyone can live a free and more self-directed life.*

In the real world, when deciding and planning, there will still exist uncertainties as decisions that need arrival at with [some degree of] incomplete information and not enough time. We design systems so that accurate information about all decisioning in the community is available to all people. Economic goods and services ought to fulfill human needs, not pseudo-satisfy them.

> **NOTE:** *All economies, because they involve resources from the real-world, carry uncertainty.*

Any form of system design must have a blueprint to work toward, or the designer(s) are engaging in wishful thinking; and, society is no different. As with all technical plans humanity must have a design apparatus and blueprint or the work is destined to fail.

> *"The major problems of the world are the result of the difference between the way nature works and the way people are conditioned to think."*
> *- adapted from Gregory Bateson*

2.3 Branches of production [service]

Technology is [a] production [platform]; wherein, production may be generally divided into two branches (under market-State conditions):

1. **Production of means of production.** Production of machines and raw materials used to produce the means of consumption. The machines that produce the deliverables are the deliverable
    A. The skills, tools, and resources that produce habitats. Habitats that sustain and duplicated the habitat, as a physical service for human need fulfillment, must be created.
2. **Production of means of consumption** using the means of production, the machines, to produce final user deliverables. Production of consumption goods, finished goods, and finished deliverables. The deliverable is now produced by the machine(s).
    A. Habitats are platforms for serving human need by maintaining life services, producing finished products, which are shareable at the local, regional, and global scale. Habitat teams contribute to the continuous and optimized operation of the habitat as a service to all humanity.
3. **Production of an integrated habitat** [service network] operating to directly meed individuals' human need requirements. A habitat service system network is constructed wherein contribution is integrated with the means of production, integrated with means of consumption, and calculated for what is possible and probable over time. The habitat services are the means by which human need fulfillment services are safely and appropriately met. The means of production is the integrated habitat that acts as a service support platform producing material services and objects for local, regional, and possibly even, global usage. The deliverable and machine that produces it become habitat where common heritage resources are accessed in a coordinated manner by means of team, common, and personal access tags.
    A. Habitats are locally integrated centers of production [of the habitat service support sub-systems]. Integrated habitat service systems are

the primary deliverable.

To produce and sustain community, the two points of production (Read: means of production & consumption) need to be in sync, because the branch of production that produces the means of production has to produce the means of production for itself and for the means of consumption branch. In community, the point of synchronization is the habitat service system network, where resources are shared and habitats are master-planned via working groups.

> **NOTE:** *In concern to production, there are the production plans for the fixed means of production, and there are the production plans for the final deliverables made through the fixed means of production. In community, habitats become the fixed and service-oriented means of production of [human] fulfillment.*

Integrated habitats are planned production environments. Therein, what is produced, may be produced for local, regional, and/or global usage. Technology (cultivation, sector, etc.) production in community may be local, regional, and sometimes, global. The more complex and resource intensive a technology is, the more likely it will be that that technology is produced at a regional scale instead of a local scale. Another example is electrical production, which may be a mix, produced regionally and also, where flows are available (e.g., wind, solar, hydro) partly locally. There are places where people live that are not conducive to producing electricity and places where people do not live that are (e.g., hot places with a lot of sun and windy places with a lot of wind). It is possible to image that one day in the distant future there may be one location on the planet that produces most of the electricity for the whole planet.

2.4 Phased forms of production [service]

The common decision space accounts for three forms of production:

1. **Continuous** (A.k.a.., fixed, constant).
2. **Ad hoc** (A.k.a., on demand, flexible).
3. **Cyclic** (A.k.a., seasonal, periodical, cyclical).

Everything produced with one of these production tags has one of two other tags associated with it: in-production service; or, structure. Something that is structural becomes part of the Habitat Systems Service infrastructure. This integration of a structure into the Habitat systems infrastructure may be temporary (i.e., ad hoc or cyclic) or may be permanent (continuous). A structure is integrated into the infrastructure of the Habitat system for some "serviceable" duration of time. Continuous structures live out their usable / functional lifetime as a fixed component of the infrastructure. Production refers to a good or service being produced in some quantity and not integrated directly into the Habitat system's service infrastructure for any period of time. These are more flexible services. Note, that services always involve some infrastructural component, but the degree is relevant here.

Hence, there are six different production tagged input

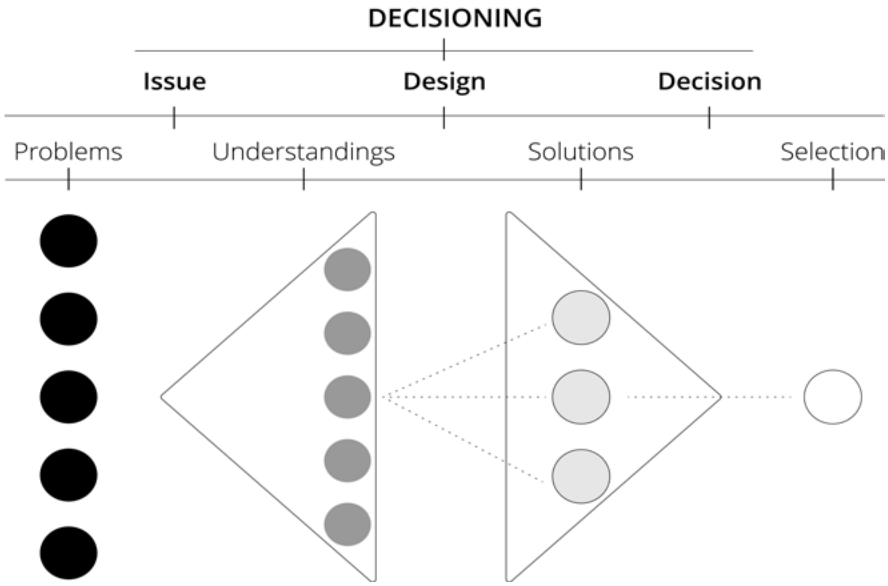

Figure 11. *This is a high-level flow-type chart of a linear process of: being presented with a problem that becomes and issue (on the left), which requires some set of understanding to design a solution (by comparison) in order to determine the finalized and single selection of a solution among those available, which are understood as completely as possible. And then, there is feedback upon whether or not the solution, when acted upon and/or operated resolved the problem as expected. An economy can be formalized and calculated as a matrix of informational (conceptual) and material (numerical) systems. When there is sufficient information to input into (Read: to inform) an open software system, based on a deeper conceptual system, then decisions about the allocation of global resources become possible. When there is sufficient contribution, together with the necessary information, and the necessary accessibility of resources, then global economic planning becomes possible, if not probable. Global economic planning necessitates the acceptance and contribution to a global socio-technical standard of specification and operation. In the early 21st century, there are technical standards accepted to ensure the efficient and inter-operative nature of a technical society. Rights and other political standards and legislation govern, significantly, the social operation and potential adaptation of society.*

units to account for:

1. **Continuous production** – continuously recycled material space; such as food and energy, which are continuously needed and therefore continuously produced and recycled. For instance, a water recycling system is similarly a continuous production.
2. **Continuous structure** – the production of an absolute structure in material space, a building and service infrastructure with a functional space requirement – in other words it is continuously existing, not changing location or function. Continuously stationary.
3. **Cyclic production** – seasonal foods or items that are produced in some cycle and may be inventoried/stored as "input" at an access center.
4. **Cyclic structure** – a temporary cyclic event (e.g., an annual celebration); something that is set up and taken down on a cyclic scheduled basis.
5. **Ad hoc production** – produced on demand; many goods are produced on demand with reserve.
6. **Ad hoc structure** – a temporary event; an incident response event boundary is an example of this; a re-attachable crane is another example. Ad hoc structures generally exist to build, to take down, or to "section off".

The form of production described herein is akin to an on demand catalogued (or application) production system for goods and services. The more thought responsive an economic environment is the more it will naturally come to resemble a customizable catalogue for on-demand production applications. Through technological ephemeralization the tendency is toward a more thought responsive and "on-demand", customized service system. A community can host both a physical library system as well as a digital library "inventory" for on-demand production. A library is a location with a set of products available from an inventory (of products). Libraries can be browsed by someone with a preference for their selection of what to access.

Inventory (digital & material) is assessed through a dynamic and direct feedback link between production, distribution, and demand. Inventory accounting and tracking is an entire area of study unto itself, and it is being done this very day at a globally massive scale. It is an access system, an item can be returned at any time for re-processing through the system.

> **NOTE:** *It is possible to be adapted to variation and variability (e.g., temperature variation and diet variability).*

2.5 Flexibility of production [service]

In a sense, there is a scale of flexibility, from the fixed three-to-five year habitat master planned operation, including services and infrastructural objects, to that of light and flexible production cycles of, generally, personal, but also common, access items (and areas). Some of the provided objects are provided to some planned and preferred cyclical production (assembly-line manufacturing, event hosting), others are produced on-demand (incident response, 3D printing). Architectural-infrastructural installations are themselves objects of the materialization process of construction.

Production for user access may be optimized by classifying production as:

1. **Flexible** (customizable during production cycle) - a production cycle can be tailored (customized) to meet a change in user preference.
2. **Cyclical** (master-planned, then operated, and then re-master planned, ...) - a master-planned production cycle, which involves:
   A. **Habitat production cycle (a.k.a., long-cyclic production events):** The product is a complete and total (integrated) habitat production (a.k.a., total urban planning, total city system, integrated city system).
   B. **Machines production cycle (means of production production cycle; a.k.a., medium-cyclic production events):** The machines that produce the habitat and habitat service-objects are produced in a cycle.
   C. **Goods production cycle (a.k.a., short-cyclic production events):** The products are objects used and consumed by people. Goods (non-fixed, chattel objects).

2.5.1 Classes of production

The following are the categories of possible production:

1. **Light production** (a.k.a., light "means of production") - primarily personal and habitat common-access usage objects. General production of user objects for the usage of teams, common users, and personal users:
   A. Cultivation with light processing prior to production into a service-object.
   B. Assembly-line manufacturing using machines and some degree of automaticity.
   C. Team-cooperative factory (i.e., lab, workshop, etc.) manufacturing.
2. **Medium production** (a.k.a., medium "means of production"; note: sometimes not an identified category; i.e., only light and heavy are the production categories) - refers to the integration of heavy products into:
   A. Major machines.

B. Fixed architectural-infrastructure.

3. **Heavy production** (a.k.a., heavy "means of production") - primarily produces intermediary products, and thus, the products are for InterSystem materialization services. Generally occurs outside of population densities. Heavy production processes include, but may not be limited to: extraction, mining, heavy chemical production, and mono-agriculture. The products are not used directly by end users, but are used by the "means of production" (light and medium production) to produce end products. The primary products of heavy production are minerals and chemicals (for use in medium production of machines and habitat architectural-infrastructure).
   A. **Mining of minerals production** - produces minerals extracted from the surface and sub-surface of the earth. Generally considered heavy production.

2.6 *Economic planning [service]*

A.k.a., Economic calculation, economic plan, economic sciences, economic decisioning, economic matrix diagrammatic decisioning, mathematical economics, , centralized planning, economic cybernetics, operation research, optimization econometrics, industrial ecology, global resource accounting model.

Every externalized service system has some degree of forethought. Herein, economic planning is a mechanism for calculable allocation of common resources between and within socio-technical organizations to meet user demand directly; and, because it is cooperative and direct, it is held in contrast to the market [price] mechanism for economic calculation. Whereas economic planning can occur within a cooperating structure, the market mechanism specifically occurs within a competing organizational structure. In a planned economy, the allocation of resources is determined by a comprehensive plan of services and production that specifies and probabilistically configures all service entities with the allocation of resources in time. Note that all large corporations [in the market] do central economic planning internally for their own benefit. Many State authorities centrally plan their governments and socialized jurisdictions. Fundamentally, economic planning (is strategic planning) is planning and preparing in advance to respond flexibly and transparently to a range of human need fulfillment requirements.

The Soviet Union performed a type of early economic planning under a project called “Gozplan”. Therein, all calculation were done manually and included prices. Gozplan is considered an early form economic planning because it used “the method of material balances”, which predates Kantorovitch’s work on economic input-output planning from the 1950s-1960s. The method of material balances accounts for a certain amount of output from a given industry, and then, calculates the spread across multiple industries.

Whereas market economists claim that in order to compare different ways of producing things (via outputs & inputs), their optimal method of comparison is the price mechanism (i.e., the items costs in the market where there is trade and competition over supply and demand). Kantorovich showed that if you agree on the mix of outputs, then it is possible to design a structure to arrive at an optimal (or, equally rational/more rational), allocation of resources than the market, using a dimensional matrix of inputs and outputs (a database layout and operational technique) revealing the ratio of inputs to outputs.

A economy can be represented as a network configuration (or “network architecture”) of the cycle of resource flows and transformation from source to production to usage, and its return cycle.

> **INSIGHT:** *A total city system approach requires overall planning to attain a higher standard of living for everyone.*

2.6.1 Rational economic decisioning

A.k.a., Rational economic planning, automated economic planning.

At a higher level, an economic system is a decision system. It is a decision system about the transformation of resources into final usages. Rational systems use reason and exhibit universal drives toward self-preservation (self-protection), resource acquisition, replication, adaptation, and efficiency. In other words, rational systems apply [reason-able] safety scaffolding strategies toward their decisioning methods [in order to meet their drives and fulfill their needs]. Herein, a rational plan involves [at least] the conceptions of definition, formulation, implementation, evaluation, and modification (based on feedback).

This economic model may be known as a ‘rational economic model’. The rational economic decisioning principally states that if we understand the environment that we are in, then decisioning involves imagining the different actions we might take, visualizing and otherwise simulating the state-dynamic that those actions are going to lead to (i.e., the action space), and then, taking the one that leads to the outcomes that are best for us (and our goal, purpose, or objective). And, if we don’t know the environment, then we need to both visualize it and test it out; we need to ‘learn’. In other words, this form of decisioning is a systematic way of perceiving forward. This economic system encapsulates this understanding into a series of algorithmic micro-calculations and a set of capability inquires. Also, rational economic decisioning asks two additional questions in order to orient decisions in it environment: What is our goal (intention)? What do we have to do to fulfill our goal (task)?

An efficient economy is the creation of a system and then an optimization within the system until a new system replaces it. Remember, efficiency needs direction: we can optimize for profit or for fulfillment, which are contradictory [structural] directions. And, how many tiers of profit extraction and monetary making is there in your society?

"Failure to plan, is planning for failure" is an absolute misquote of the original quote, which is, "We don't plan to fail, we just fail to plan." The two are poles apart in meaning. A failure to plan cannot be a plan for failure, because every plan is built to achieve an objective. Failure cannot be an objective for a rational person, unless that failure is some kind of ulterior way to gain a larger objective. For example, an unscrupulous person may deliberately sabotage a meeting in order to gain importance (you people couldn't achieve the objective through a meeting, but I achieved it my own way). In normal circumstances failure is not an objective, and therefore, there cannot be any plan for it (unless the failure was intentional). When we see the original quote, we see the significance of the way it is phrased. It implies that failing to plan leads to failure. However, in the misquoted version, there is an implication that failing to plan is a deliberate, mapped out effort to fail. This, as any rational person can testify, is simply not so.

> **INSIGHT:** *The more prepared we are, the greater our potential to accelerate our personal growth and navigate a responsive environment.*

2.6.2 Logistics

A.k.a., Logistical economics, transport logistics.

Logistics refers to the wide set of activities dedicated to the transportation and distribution of products, such as the material supply of production, as well as related information flows. From the perspective of discovery, logistics is the science of moving an object(s) from one location to another in the most efficient, effective and optimal way (known). The kinds of problems that concern getting an object from one location to another most efficiently are known as optimization problems.

Logistical activities are grouped into three major functions:

1. How to best create and move objects through a transportation network? The physical moving distribution of objects via transportation pathways to end users and/or storage (etc.).
   A. The physical occupation of existing locatable space by some object under transport.
2. Informational coordination of materialization, including physical production, transportation, consumption, and re-cycling. (a.k.a., materials coordination, materials management).

Physical distribution is the collective term for the set of activities involved in the movement of products from points of production to final usage. Materialization considers all the activities related to the production of products in all their stages of production along a supply chain.

Depending upon its specific application the term logistics has a variety of related definitions. Herein, logistics refers to the flow and storage (i.e., inventorying) of goods, services, and related information (i.e., material service information) between the point of origin and the point of destination in order to meet user requirements. Logistical processes involve information, communication, and transportation systems. It is essentially the planning and carrying out of the movement of resources to, and sometimes through, a system. In other words, logistics is the process of identifying the optimal means by which to move material service information - information which has entered the presence of the material service system. There are two logistical service systems: communications (digital service information) and trans-distribution (transportation and distribution - material service information). Logistical processes control the movement and direction of matter and electromagnetic flow. These two physical service flows move matter and energy within the unified, materializing information field. In the material system these service flows form a coordinated network of pathways, conduits and technologies for the movement of information (e.g., humans, electricity, data, and objects) within the field.

2.7 Lifespan [service]

All dynamic systems have lives, no system is eternal. All systems have lives because all systems have internal contradiction and over time they move off from equilibrium, and when they move far enough from equilibrium they begin to oscillate. The oscillation becomes so great that it causes the system to destabilize into what in the science of complexity is known as a "bifurcation". The system does not survive, but where it will go is uncertain because there are two alternative possibilities. Either the system can be born again with a new model, a model that makes the old model obsolete, or the system can be left to its collapse and eventual decay.

Aging (or 'senescence') is an intrinsic side effect of the normal operation of a material body (or technological good / service) due to the presence of entropy in the system. The normal operation of a material system generates side effects, generates damage, molecular and cellular (in living systems) causing changes to the structure and composition. Those changes accumulate over time and throughout the life of the system; they are generated as a side effect of even simple operations that are non-negotiable to the system. The operational life of a material system is known as its 'lifespan'. Lifespan is multi-factorial (i.e., there are multiples of factors that influence lifespan).

Aging is possibly inevitable in a material system, regardless of extropy (i.e., the replacement of parts). There is, however, a minimum rate at which these changes can occur. What is not inevitable is that such damage should remain unrepaired. We can intervene and provide an external influence to facilitate a longer lifespan of the system. For example, medicine is supposed to be about restoring health to a living biological system. The essence of medicine is the facilitation of restorative mechanisms as well as repair to the ongoing and accumulating molecular and cellular damage in the human body system, and thereby, keep it below a level that causes disease, disability, and malfunction.

Some systems are set up to tolerate a certain amount of damage, and it is only when the damage accumulates beyond a certain threshold that things start to go wrong. Hence, medicine may not only be restorative, but it may also be preventative (i.e., preventative maintenance that prevents damage before it builds up) -- periodic preventative maintenance.

> **CLARIFICATION:** *Lifespan is generally discussed in terms of "protected conditions of operation" and "normal environmental conditions of operation".*

In some sense, it could be said that the "'homeodynamic space" of a system determines its lifespan, and that the homeodynamic space shrinks as the system ages, becoming lesser over time. It becomes more prone to "things going wrong" over time and with age. Herein, aging is the shrinkage of the homeodynamic space which makes the system more prone to the diseases of age (in humans) associated with the system under observation. In designing a system we must ask ourselves, What is the most fundamental reason for shrinkage of the homeodynamic space? It is the occurrence and accumulation of molecular damage. Imperfect maintenance and repair systems allow the accumulation of molecular damage, including damage in the repair systems themselves.

Also, life can export entropy. We can remove entropy as a mechanic would repair a part of a car to keep it going. At times, functioning can be maintained and restored through replacement.

2.8 Life-cycle assessment [service]

> *A.k.a., Life cycle analysis, cradle-to-grave analysis, or more recently cradle-to-cradle analysis, environmental impact analysis.*

All systems have a life cycle. Life cycle assessment (LCA) is a systematic technique for the analysis the environmental impacts associated with all the stages of a life-cycle of a product systems from a "cradle-to-grave" perspective. Note that a life-cycle analysis can also be conducted from a cradle-to-cradle perspective. Life cycle assessment is a measurement, planning, and decision tool. LCA is focused on studying the whole product system, including the complete chain of production over the lifetime of the product system. A product system can be broadly defined as the network of processes or activities needed to deliver a product (or service) to an end user. Life cycle assessment seeks an objective and rational evaluation of the environmental impacts of a product system. Life cycle assessment is similar to input-output modeling and has related computational aspects. (Tan et al., 2018:91)

There are several forms of life-cycle analysis, each of which is related to resource positioning:

1. Cradle-to-grave is the full life cycle assessment from resource extraction ('cradle') to the use phase and disposal phase ('grave') of the product's resource composition.
2. Cradle-to-gate is an assessment of a partial product life cycle from resource extraction (cradle) to the production output gate (i.e., before it is transported to the user).
3. Cradle-to-cradle is a specific kind of cradle-to-grave assessment, where the end-of-life disposal step for the product (as a composition of resources) is a recycling process.

In a life cycle analysis, each product system is analyzed by tracing all upstream process chains to their ultimate sources (i.e., extraction of resources from the natural environment) and likewise by tracing all downstream process chains to their final destinations. In principle, the analysis should encompass the entire life cycle of the product and its resources. Analysis is also done on the basis of a predefined unit of output of a product system, known as the functional unit. The functional unit represents a specific unit something, such as service (or value delivered; e.g., life, technology, or exploratory) and/or physical quantity (e.g., measured in mass or energy units). The functional unit allows proper benchmarking in cases where LCA results are used for comparison of alternatives. (Tan et al., 2018:92)

Thus, LCA naturally necessitates a quantitative approach, analogous to input-output modeling. The four components of LCA as outlined in the ISO 14040 and ISO 14044 standards are (Matthias et al., 2006):

1. Goal and scope definition - Identification of purpose, system boundaries, functional unit, technological assumptions, the natural resources, pollutants and environmental impacts of interest, data sources, and other relevant assumptions.
2. Life cycle inventory analysis (LCI) - Estimation of flows of natural resources into and pollutants from the product system per functional unit.
3. Life cycle impact assessment (LCIA) - Estimation of environmental impacts of the product system per functional unit.

4. Interpretation - Use of information derived from previous steps to address the purpose of the LCA and to determine whether or not the results are sufficiently conclusive given the errors and uncertainties that occur in the analysis.

2.8.1 Product life-cycle lifespan

There are two general life-spans for products in an economy (for meeting the final needs of end-users):

1. **The maintenance lifespan:** Objects that are to be used repeatedly by the same person or different people (Read: repeated use), and may need some maintenance for their nominal operating status to be maintained. In a habitat, there will be personal-access, common-access, and team-access technologies with maintenance lifespans.
2. **The sustainable single-use lifespan:** Objects that are to be used one-time, collected, and refurbished or cycled. In any society there will be objects that are used one-time, and then, refurbished (e.g., sterilizing) or cycled (e.g., melting and reforming, or composting). Here, a product is used once, and then its resources are collected and used for the same purpose, or are re-purposed. Here, waste streams become the source of raw materials (a.k.a., circular economy, doughnut economy, etc,).
3. **The wasted single-use lifespan:** Objects that are to be produced, used once, then wasted into a landfill (i.e., having a single-use lifespan). A significant amount of trash is generated by people's processes in disposing of end-use materials from their homes, such as cardboard, paper, building and packaging materials, expired items, plastic, etc. Here, the resources, after use, are either (1) a pollutant in the environment or are (2) placed in a landfill of mixed wasted products. A single-use economy is a problem for resource sustainability. Single-use plastics are particularly problematic due to their non-biodegradable nature and their significant contribution to environmental pollution, including landfills and ocean waste. These materials, designed for temporary utility, persistent in the biosphere for centuries, exacerbate waste challenges and posing serious threats to wildlife and ecosystems.

2.9 Societal sustainability [service]

The earth is a semi-closed system. The earth is closed to the flows of material input and output, but open to the flows of energy (and work). Note that in general, the only cosmic input is solar energy, and the earth's only cosmic output is heat. Herein arises a general problem for human health and reproduction, all of the resource materials needed by human society must be obtained from a finite, non-renewable supply within the earth boundary as a supra-system, without denying other necessary earth sub-systems access to those resources. Similarly, the outputs from human society must be absorbed by other societal and ecological sub-systems so as not to become sequestered as unusable waste or worse, toxic to other subsystems. (Mobus, 2017:545-546)

The human societal system (i.e., social, decision, lifestyle, and material systems) is a sub-system of a whole environmental earth-hominid system (e.g., the Real World Community Model). Sub-systems of a semi-closed supra-system must fulfil a 'purpose' in the context of the larger [societal] supra-system in order for the system to remain efficient, and ultimately, sustainable. The success of a system in interacting with its environment over an extended timeframe depends on that system's ability to regulate its activities, both internal and external so as to remain effective and adaptive, which are necessary conditions for its sustained continuance. Whereas an effective system is a system that meets its purpose (or function), an adaptive system is capable of modifying its behaviour in order to accommodate some variation in environmental conditions that places the entity under stress. (Mobus, 2015:6) The roles of effectivity and adaptivity, and the mechanisms of a cybernetic control subsystem ("governance") in maintaining these, are the means for achieving sustainability in all types of complex societal systems. (Mobus, 2017)

In order to regulate activities, a system/entity may apply principles associated with control and coordination ("governance") within its decisioning process. Therein, a priority-based (adaptive) and hierarchical-based (veridical) cybernetic societal system (PCSS and HCSS) provides the potential for (Mobus, 2017):

1. The internal regulation of subsystem interactions (*operations*).
2. Coordination of a subsystem of interest with other subsystems in the [societal] supra-system (*operations*).
3. The design of subsystems (*development*).
4. The potential for strategic evolution of the whole societal system in anticipation of future changes (*development*).

Mobus (2015) argues that a hierarchical cybernetic decision system (HCDS), when properly architected and constructed, and working with veridical decision agents [with sufficient decision models], is how natural systems such as cells and higher organisms (including eusocial colonies) persist over evolutionary time.

Mobus (2015, 2016, 2017) uses the acronym HCGS instead of HCDS - hierarchical cybernetic governance system (HCGS) versus hierarchical cybernetic decision system (HCDS). The societal system described herein seeks to remove and replace the conception of "governance" as much as possible, since it carries market-State connotations that do not apply under a community-type societal system. When Mobus (2015:4) uses the term 'governance', he means 'hierarchical cybernetics'. Since a cybernetic system is a combination of a controlled dynamic system and a control system (Parin et al., 1966), the term 'decision' is used herein in place of 'governance'. Alternatively, it may be possible to refer to the system as a hierarchical cybernetic control system (HCCS) or hierarchical cybernetic societal system (HCSS).

The decision system herein is both adaptive (PCSS) and veridical (HCSS). Veridical decisioning is based on the identification of a correct response, which is intrinsic to the external situation and may be subject-independent (a.k.a., actor-independent). Adaptive decisioning is subject-centered (a.k.a., actor-centered) and is guided by the subject's (actor or actors') priorities. (Goldberg et al., 1999:364) Within the decision system for a community-type society, the Value Inquiries processes represent adaptive [priority] decisioning, and the Solution Inquiry process represents veridical decisioning. A whole decision system for a complex and adaptive societal system must account for both guiding priorities and the optimal selection of the next solution iteration of the state of the society (and its services).

For a complex socio-technical society, a designed and appropriately informed cybernetic societal system (CSS) is a prerequisite for achieving adaptability, resilience, and [individual human] fulfillment, which are the necessary capabilities of societal systems that seek a sustained existence.

All designed control systems have a purpose. Systems designed with a purpose are sometimes called purposive systems; they are goal-oriented. The term 'purposive' signifies that the system actively seeks a goal that will provide it with some kind of completion, reward, or fulfillment, which gives rise to the concept of a social fulfillment (completion or reward) function. The market, and competitive/hierarchical societal systems in general, incentivize by rewarding with an abstraction, 'money'. In a community-type society, the result of fulfillment/completion is 'access', directly.

All truly purposive systems obtain resources (e.g., material and energy) from sources in the supra-system. These systems do real work using energy to transform materials for their own internal use, and they output products to other systems and wastes to sinks. Mobus (2017:3) states, "A purposive complex adaptive and evolvable system produces outputs that are acceptable to environmental sinks." Therein, growth potential is ultimately a function of availability of resources and the capacity for waste sinks to absorb and nullify wastes. In addition, systems produce outputs that fit the criteria of acceptance by environmental entities by virtue of their structures and functions arrived at by either evolution or design. Such systems are capable of recovering from disturbances within limits. (Mobus, 2016)

A properly functioning sustainable societal system provides [at least] three capabilities:

1. Adaptable to environmental changes.
2. Resilience for maintaining functionality despite such changes, and repair when those stresses are extreme.
3. Effective fulfillment of each sub-system's purpose to provide requisite functionality.

Sustainability is sometimes defined through a developmental viewpoint:

> *Sustainable development is the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

This definition contains within it two key concepts:

1. The concept of 'needs' (requirements for life); and
2. The conception of 'limitations' (constraints for living).

Although useful for societal service subsystems, this definition fails to address the necessary conditions that would have to be met for the persistence of a societal system as a whole; that is, what would be needed for humanity to say the societal system is currently sustainable as a whole.

Mobus (2017) provides an working definition of sustainability of all complex systems:

> *A system persists in structural, functional, and purposive conditions into an indefinite future. Sustainable processes are those that can continue into an indefinite future.*

Then, Mobus (2017) describes the necessary conditions for the sustainability of all complex systems -- a system persists by meeting the following set of necessary conditions:

1. **Fulfil a purpose** - produce valuable outputs.
    A. All material flows in a semi-closed system must by cyclical (Daly, 1996). There can be no build-up of waste materials or the exporting of materials that would be toxic to other subsystems. For a sub-system to serve its purpose, its outputs should be useful to other subsystems. They should be produced at a rate commensurate with that at which the other subsystems can absorb and use them. Every subsystem within a supra-system has co-evolved to provide some other subsystems with products or services that contribute to the sustaining of those recipient subsystems. The subsystem can accomplish this function only if it can maintain its own sub-processes in working order. It must

have internal regulatory functions that detect deviations from normal working and correct them as quickly as possible. It must be able to repair itself using some of the inputs.

2. **Receive inputs** - to produce and to know what to produce.
   A. The subsystem must be able to obtain all the resources it needs to: (1) maintain itself, and (2) produce the desired outputs to the rest of the supra-system (i.e. fulfil its purpose). Because the resources it needs are actually outputs from other subsystems and those subsystems can only produce those resources at rates determined by the mass balance of the whole system, the subsystem is constrained to obtain such resources at the 'natural' rates at which they are made available. A condition 2 corollary is that in order to ensure stable fulfilment of purpose, the subsystem must have a capacity to measure those rates and adjust its internal rates of usage in accordance. Subsystems must 'measure' the efficacy of their inputs and that of their outputs (relative to the absorption capacity of the sinks with which they are coupled) and regulate their activities accordingly
3. **Be adaptable** - The subsystem must be adaptive within the ranges of variation in extant conditions in the larger supra-system.
4. **Be evolvable** - A complex adaptive and evolvable system (CAES) subsystems are, over the long run, challenged to undergo evolutionary changes (Mobus, 2015) to adjust their workings to the changed needs. This may mean a simple readjustment of the norms and ranges of their adaptive capacities (e.g. the predator evolves faster running capacity in response to faster prey). Or it may mean creating new internal capacities to obtain substitute (or better) resources or produce new goods and services (i.e., in the market, products or services for new 'customers').

If these four conditions are met, any subsystem should be sustainable indefinitely, until one of the conditions is not met. These four conditions can be derived from Miller's Living Systems Theory (1978), that is, subsystems identified by Miller work to provide the processes that produce these conditions. (Mobus, 2017)

2.10 Self-organizing systems

> **MAXIM:** *A system behaves in accordance with its [designed] nature.*

From an engineering perspective the design of a self-organizing (self-directing) system is generally viewed as comprising two different phases:

1. First, the behavior of the system must be described as the result of interactions among individual behaviors, and then
2. The individual behaviors must be encoded into controllers.

Both phases are complex because they attempt to decompose a process (the global behavior or the individual one) that emerges from a dynamical interaction among its subcomponents (interactions among individuals or between individual actions and environment). In other words, a self-organizing systems decisioning process must be made explicit if global and individual behavior is to be understood and re-oriented toward greater fulfillment and well-being.

Since individual behavior is the result of the interaction between agent and environment, in an incompletely modeled (or inaccurately simulated) system it is difficult to predict which behavior results from a given set of rules, and which are the rules that will create a given behavior. Wherein, difficulties will occur in the decomposition of the organized behavior of the whole system into interactions among individual behaviors of the system components. Here, the understanding of the mechanisms that lead to the emergence of self-organization must take into account the dynamic interactions among individual components in the system and between components and environment. Given a set of individual behaviors in an obfuscated system it will be difficult to predict which behavior at the system level will emerge, and it is also difficult to decompose the emergence of a desired global behavior in simple interactions among individuals (i.e., the appearance of "irrationality"). In addition, the role of the environment in relation to the emergence of the global pattern should not be neglected in design.

2.10.1 Swarm resiliency protocols

> **INSIGHT:** *The ultimate purpose of intelligence is to ensure the survival of its carrier.*

In some ways, the strategic protocols described by a global production and distribution service architecture could be referred to as 'swarm resiliency protocols', for they are designed in an emergent manner to re-create an adaptive consensual information model for coordinating decisions across the network of our community. Herein, they are designed to avoid socio-economic instability, and to intentionally iterate toward access fulfillment and resource abundance at scale (through cooperation). This behavior is known in the literature as 'swarm intelligence' - this decisioning system is a distributed access systems, which behaves with social-swarm intelligence.

The ultimate arbiter of swarm protocols (as socially-coordinated decisions) is the community itself, in which a multitude of decisions lead to the acceptance or rejection of any particular protocol. Herein, the acceptance of a protocol as a 'standard' is something that occurs independently of "formal endorsement" by a "standards body". Herein, a protocol becomes accepted as a 'standard' through its codification and actual use. Regardless, the ultimate test of a protocol is whether or not it becomes widely accepted and implemented in the community [by the individuals and teams who use it to provide for their own fulfillment].

What do protocols do if not structurally transform potential in a routine manner. With the structural transformation of potential comes a decision space (i.e., "choice" in how to orient our structures). We have the "choice" to transform our world into one of fulfillment and greater meaning through the way in which we understand our responses and commonly direct our movements.

In a system, 'intelligence' might mean how efficiently the system is capable of controlling for feedback in a given situation. 'Negative feedback' (a systems term) provides a 'value space' to direct the orientation of a response in a desired manner (i.e., 'control'). A system might use a 'control protocol' to set boundaries around the transformation of particular information set, which may be a material resource. A very straightforward example might be the following: a loving parent wouldn't give a 5 year old a loaded pistol to play with. This is a very simple protocol. When a pistol enters the information space of someone untrained or incapable of using it safely, then turning it over to an untrained user would increase the probability of death and or suffering. Hence, a healthy structuring of behavior (i.e., socially intelligent coordination) would dictate not giving the gun to the untrained user, particularly a child who may not even understand the concept of a 'weapon'. This 'protocol', as a restriction of material access, is not equivalent to 'secrecy', which involves the permissive denial of access to information.

Remember, an individual's value orientation is important here. Someone with the type of value orientation standard in early 21st century society would not function well in a swarm intelligence system until s/he adapted to the "functioning of the swarm".

2.10.2 Open protocol revisioning

Protocols are usually not static, but instead typically undergo revision and enhancement in response to experience and/or changing community requirements. In some cases, continued development and enhancement of a protocol is accomplished by means of an interdisciplinary team, other times the protocol might be enhanced by an individual seeking to understand and solve a problem elsewhere in the system [that happens to interrelate at a deeper level with a pre-existing protocol].

Participatively adaptive protocol development and its application within a swarm-intelligence economic network may be described as a "coordinated egalitarian strategy" to common human well-being and fulfillment.

By making the protocol development and modification processes available to all, then all users are on an "equal footing". The application (or "success") of any protocol can then be determined on the basis of its own merits, not on its origin or an artificial endorsement. Herein, protocols are decoupled from artificial social constructs and re-coupled to that which it is possible for us to all commonly experience existence of, the real world. The frameworked structure by which protocols are developed must be responsive to its environment (to us and to our redesigns for ourselves and our fulfillment in a common ecology).

In a decentralized-distributed emergent system the system's network protocols change when those in the network agree to use a different protocol (or version of the protocol). The blockchain technology behind the Bitcoin ledger, for example, can be updated as long as the participants in the network agree; this is known as a "hard fork" to the protocol.

Due to the transparent and open design of the Community's structure everyone can audit everything someone does to the structure of the habitat service system itself. Hence, accountability is structurally reinforced and the incentive to harm the system is reduced.

2.10.3 Decisioning protocols

Decision protocols resolve decisions about the transformative flow of information in the form of a resource. If we don't carefully design our protocols we are unlikely to optimally align with fulfillment. If we don't align our designs they are likely to re-transform us. For example, if we build a bridge poorly that bridge might collapse and hurt us. Maybe we begin to ask ourselves what we are doing to ourselves when we re-encode the idea that competition is a necessity. We design things so they don't unintentionally hurt us (either physically or our overall well-being).

The protocol isn't there to tell anyone what to do; instead, it transforms information in the way we design and verify it to transform the information. A protocol isn't a test from authority. It is an optimized way of doing something. We can now commonly create and iteratively adapt ourselves for the fulfillment of everyone.

A protocol is an access routine, and it is analogous to an individual's daily routine. A 'daily routine' is a series of behavioral events performed in or around the same way on a daily basis. Whereupon, a 'protocol' is a set of information transformers, and expressed behaviors, that are performed in the same manner on a routine basis.

2.10.4 Collaborative protocols

In nature, there are laws (or technical regulations) that in a very real way restrict our behavior in this environment. Hence, there is a need to design our decision spaces and our habitat [through protocols] in such a way that they account for these natural laws (if we are to maintain sustainable fulfillment in the community). To maintain our community we have to be sustainable and efficient, and therefore, we have to follow some set of coordinating [technical] rules (a.k.a. protocols) in the iterative design of our habitat. Fundamentally, collaboratively developed protocols are necessary to maintain the coordinated integrity of the Community.

Protocols anticipate and automatically focus computational attention [toward an outcome]. In community, protocols are cooperatively and transparently formalized toward an explicitly intended "outcome". Herein, collaboration reduces the possibility of human error (and bias). Collaboration facilitates the emergence of a commonly intended system wherein the very idea of "negligence" would seem odd. Why would someone even be "negligent" in a resource-based economy? If negligence means to be inefficient on purpose, to be "lazy" (in the pejorative), then how does this state of being arise from contributors and participators who have no drive or desire to be wasteful on purpose. The difference is [partly] in the environmental signaling. Herein, designs that are not "feasible" (i.e., do not align with the design protocol) are rejected by the formalized calculation system [with accompanying reasons, suggestions, and substitutions]. Designs are feasibly confirmed before their transport acceptance is processed.

So, in part, decisioning is the standardization of protocols that allows the system to be functional and abundant without micro management oversight (Read: with automation) and to be strong/adaptive (i.e., resilient) in the face of stressors.

In order to understand a resource-based economy one must first have begun to adopt and actualize a valued approach that recognizes the benefit of systems distributed thinking and formalized computation. Also, one must have begun to experience compassion as well as a realization that one's constructions are not the center of everyone's universe. Herein, the computation reads the total environment and arrives at an according adjustment to the habitat service system, which may or may not involve the additional exertion of human effort.

> **NOTE:** *Thought responsive environments exist along a spectrum. Advancements in technology essentially allow us to localize the material production of our thoughts to our place of focus more quickly in delta(t) - we can kill with quicker focus or we can fulfill with quicker focus. Over time, the re-tooled development of technology generates a highly thought-responsive material-like environment. An environment where you think something and you can have that thing manifest. The question then becomes, how is this materialization technology oriented and how is it corrected for feedback by the social system? It is correcting for feedback isn't it? A highly thought responsive environment that doesn't correct for feedback cannot focus its adaptations toward a more fulfilling design.*

Our systems are:

1. Systems that work with us rather than against [our] nature.
2. Systems that promote harmony.
3. Systems that facilitate the correction of our distortions.

We are designing a system to:

1. Maximize our freedom of thought of inquiry of fulfillment
2. Maximize the effective fulfillment of our needs and intentions
3. Maximize the efficient fulfillment of our needs and intentions
4. Do so in a discoverable universe
5. Do so in a discovered environment
6. Do so in an emergent habitat
7. Do so in service to ourself
8. Do so in service to our community
9. Do so in service to our unity

2.10.5 Traceability protocols

One of the responsibilities of an "enterprise architectural system" is to provide complete traceability from requirements analysis and design artefacts, through to implementation and the recycling of project iterations. The term, 'traceable', is an adjective that refers to the verifiable trace of a signal signature in an environment. Wikipedia states that, "The formal definition of traceability is the ability to chronologically interrelate uniquely identifiable entities in a way that is verifiable."

The easiest way to understand the idea of traceability is to see a visual depiction of it. *There may be different possible views when tracing information, such as,* **forward traceability** for a diagrammatic visualization of traceability in the planning of a design based upon a change of requirement; **layered traceability** for a visual representation of traceability throughout the habitat information systems architecture; **lateral traceability** depicts the traceability of resources throughout a commonly coordinated 'access space.

A structure that facilitates tracing is likely to optimize performance and accountability at every scale. At the scale of interdisciplinary teamwork, individuals maintain accountability by completing work under the publication of their public [cryptographic] key in association with their individual social profile of skills and past project efforts.

Principally, the potential for traceability leads to the potential for accountability of individuals in their modification of the architecture of the community habitat-system.

2.10.5.1 The GitHub example

A key concept within Git is the "pull" request, in which a developer formally asks for some code that they have been working on to be integrated into another branch within a pre-existing, organizational-level code base. A Git pull request provides an opportunity for team members to collaborate and discuss before reaching consensus on whether the new code should be added to the application (or standard). Git also stores older versions of code, which makes it easy to fall back to the last good version if something goes wrong, and lets you quickly see what's changed between revisions.

The necessity for a set of coordinated operations overseeing the integration of pull requests, involves (Git and GitOps):

1. **Observability:** The operational system offer monitoring, logging, tracking, and visualization into complex applications so developers can see what's breaking and where.
2. **Version control and change management:** Obviously this is a key benefit of using a version control system like Git. Flawed updates can be easily rolled back.
3. **Productivity:** Developers can make constant small improvements to their codebase, rather than rolling out huge, monolithic new versions every few months or years. The continuous deployment piece is made possible by automated systems called pipelines that build, test, and deploy the new code to production.
4. **Auditing:** Thanks to Git, every action can be traced to a specific commit, making it easy to track down the cause of errors.

Github is an application service for [software] project development. And, it represents the encoding of "traceability" at the [software] project development level. Users of github have profiles that account (or trace) their actions and behaviors, while accounting for reputation commenting (i.e., the potential for anonymous criticism) by social others. A user's github account shows how many 'commits' (Read: commitments) have been made [to projects], how many projects have been developed, how impactful they were and "you" were. A github profile provides precisely the type of information a community requires about ongoing human effort into the community itself. The application service 'Stackoverflow" represents a similar project coordination traceability system. Many technology companies are already basing their hiring and employment positions on github (and other similar) profiles. Github represents the potential for an active collaboration process.

Github works off of the idea that through the potential for an open social reputation there is a higher potential for intentional accountability, and hence, a higher degree of trust in the overall system. It is hard to get a good rating on github and it is also very difficult to make someone else get a bad rating. Herein, developing a "positive" reputation doesn't happen through influencing others or bribing them, but it is acquired through actual useful work, recognized by multiple others.

It is hard to fake a good github rating. And, in a participative environment, what incentive would someone have to do so?

In a learning community, individuals can gain an even higher "reputation" by mentoring or otherwise facilitating the sharing of design developments and new understandings. The purpose of a learning community is [in part] to facilitate sharing, is it not? If sharing is to exist then it is useful to structure sharing at every level of possibility from the private person-to-person to individual-to-"social network".

Github is also a form of distributed version control with two big difference with traditional version control systems. First, everybody who works on a project has access to all of the source code all of the time. Git's second big function is that every time a programmer uses git to make any important change, Git creates a signature as a unique universal identifier tied to every single change, but without any centralized coordination, or at least that is the potential. It is a general form of distributed networking.

Github is the manifestation of the social interrelationships of individuals whom are choosing to participate in projects together through which they gain "reputation", which is visible to the community. It is a system that allows for the potential of cooperating socially at scale toward purposeful and usefully-driven work.

3 An access-based economic [decisioning] model

CLARIFICATION: *The decision system is based on access to [habitat] services; it is based on the usage of habitat services and objects.*

The [economic] decision system described herein may be characterized as an access-based model whose functional purpose is to facilitate strategic and shared access to economic services through intentional and integrated design, rather than ownership of economic inputs, processes, and outputs. Herein, 'strategic access' (or 'strategically designed access') refers to the free and equitable access of a population to economic services (or resources) on an as needed or used basis (Read: on an *access* and *use[-time]* basis) through coordinated information and resource sharing with consideration given to future availability (Read: strategic future access and natural service regeneration). Access-based models are sometimes also known as use-base models.

All societal-based platforms must account for access. Access is necessary and two dimensional concept. Firstly, there is access to a team or working group through a contribution-based structure, and then, there is access to goods and service (without force of trade). Access can be accounted for through many types of surveys including demand surveys, contribution surveys, etc. In the market, access is considered through the cost of a sale. In the State, access is acquired through authority. Humans require, for their survival and thriving, access to objects and information, which are produced via services. In a market, access is controlled by price. Therein, the concept of "free access" is mixed with "rights" (given by authority) and "property" (purchased in the market). In a community-type society, access refers to demands and other issues for service that are accessible to users. Ultimately, the goal is to have access to that which optimally meets user requirements (human needs) given that which is available at the time of access. In a community-type society, access centers and integrated transportation systems distribute products. Services are integrated, often modularly, into the infrastructure of the environment in order to optimize efficiency and produce a higher quality experience of access [to services] by a user. With sufficient technical knowledge and ability it is possible to apply automation technologies to increase the efficiency by which access occurs. Automation technologies can free individuals for access to opportunities they might otherwise not have had. Automation technologies can also make access to services, such as medical and informational more safe, reliable, and faster. A decision that optimizes habitat services for human need fulfilment, locally and globally, is what is required.

This "shared" access-based model is the product of a rational value system; in particular, a value system that acknowledges the potential for intentional adaptation and cooperatively integrated design. Fundamentally, the survival of individuals is only limited by their [enabled] *access* to life-serving and life-fulfilling necessities. Similarly, the ability to learn (and adapt) is only limited by a learner's *access* to learnable content, learning materials, and learning experiences. Therein, if all of a community's life support needs are met and individuals are pursuing their highest potential direction, then what they require is not ownership, but access to those items that enable creative and desirable life-learning experiences. When humans have access to the necessities of life, and have adopted a rational and systematically relational value system, then the possibility for an intentionally adaptive common[unity] space opens. Basically, there is no need to "control people" or apply force against the individual (e.g., legislative law) in a society designed to adapt to the fulfillment of everyone's' needs through access-oriented design.

The access model described here is divided into three interrelated subsections:

1. A discussion of 'common heritage' from which a pool of resources originates.
2. The logistical movement and repositioning (or reorganization) of the resources themselves.
3. The utilization of resources by needed services.

This section further details why 'access' has been chosen over 'property', and then describes the foundational structure of the socio-economic model as viewed from an access perspective.

An access-based system might be referred to as a process management system (a.k.a., process coordination system). "What's in charge" is the participatively formalized system itself, not people or subjective whim. What provides access is the process, with the assistance of humans and other technical systems.

It is possible to identify three types of goals/objectives of logistical measurement:

1. **Local availability (local access)** - Local availability is defined as whether or not access is available at the trip origin or destination, or within a city. This refers to the actual availability of an object within a city.
2. **Network availability (network access)** - Network availability is defined as whether or not access is available between origin and destination, or between cities. This refers to the actual availability of an object within a city network.
3. **Comfort and convenience (customization and preferential-type access**) - The avail-ability/access-ability to edit and customize with the certain confidence of not violating others access during or after the process. This refers to subject-taken

actions that do not violate others access.

These three types of measurement goals/objectives are the most relevant to operational performance from a users perspective:

1. Can it be acquired?
2. When can it be acquired?
3. Once acquired, how can it be changed?

Both local and network availability may refer to spatial availability (wherein, a transit service is used to move objects for service access) or temporal availability (i.e., how often, and for how long is the transit service used), or both.

3.1 Common heritage

> **INSIGHT:** *Resource sharing is required to stop economic hierarchy, to prevent individual distortion, and to phase out social pathology.*

This access-based economic model views all resources as the common heritage of the whole of the community, and hence, all services as common to all individuals in their utilization of the common resources. In other words, access refers to the access a community maintains to a common pool of resources -- this is “heritage normality”.

Whenever common heritage resources are involved, then it is necessary for purposes of ecological stability for a community to turn toward an [egalitarian] access-based model for the management, allocation and distribution of those resources that are commonly accessible, for shared coordination.

Note, herein, the term ‘management’ is applied to common [heritage] resources, and not to people management. It is not the type of “management”, which shall be referred to as ‘human management’ that makes the claim that “leaders mobilize other people to get important things done” - this is ‘human management’, and it is the type of management that “gets things done through other[s] human beings” - it is a parasitical form of organizational structuring that uses others’ energies for personal and righteous ends, and is not too far akin from slavery or “human farming”. Think about this for a moment: the goal of ‘human management’ is not the empowerment of other humans to do things for themselves and for their communities that regenerate fulfilled, self-directed, and self-sufficient lives; it has other ends. Resource management does not have to involve human management; it may involve human coordination, which is not equivalent to human management by a leader or some other [managerial] authority figure. The organization of this economic decisioning system is not based upon social leadership, but is instead, design-led (i.e., it is a design-led vs. a leadership form of organization). “Great design” is a symptom of a design-led organizational structure and an experience-driven development processes.

Fundamentally, to maintain a steady and dynamic relationship with the life ground that factually services the fulfillment off our community, resource management (as a system) must maintain the clarity of humankind’s relationship with its lifeground [in the way in which it arrives at decisions that impact that common heritage lifeground]. The very idea of human management breaks that lifeground connection by ignoring human needs and ecological concerns. Instead of managing “human resources” for economic gain and politically powered purposes, a systematically designed access-based system organizes access to information and resources for transparent contribution to human fulfillment. A natural law/resource-based economy could be said to be a time and [renewable] energy management system, but it is not a ‘human management system’.

When individuals share in the recognition that there exist common heritage resources in a mutually life-grounded ecological system, then it becomes more likely that they will recognize the necessity for economizing (i.e., managing the efficient and effective strategic use of) those resources. Without a collaboratively developed and commonly formalized method for arriving at decisions about common resources, then the clear repercussion is a loss in our synergy as a community, and possibly, the "tragedy of the commons". The "tragedy of the commons" is a proposition that when humans left to their own "devices", they will compete with one another for resources until the resources run out. Hardin, the originator of the idea wrote, "Freedom in a commons brings ruin to all." (Nijhuis, 2021)

An actual “tragedy of the commons” is a state where individuals have lost their awareness that the resources in a locale are commonly connected to the well-being of all local lifeforms (and species). And, the “tragedy of the commons” is, itself, a market-paradigm deduction - it is deduced from the observation that the “tragedy of the commons” is frequently observed “in the market”; it may even be said to be premised on the presence of a market. The “tragedy” is actually a misunderstanding from the ecological systems perspective. In other words, the tragedy of the commons is [at least] a market tragedy - unorganized commercialization of nature has the potential of leading to the exploitation, excessive [over] consumption, and pollution of nature to reduce total resource regeneration and life capacity. The market is the commercialized organization of nature. The market doesn’t recognize an ongoing relationship between individuals among community and nature; instead, it presupposes every transaction (or, most transactions) as finite things with no ongoing ecological and interpersonal relationships.

In his work, “Tragedy of the Commons”, Garrett Hardin was not, in fact, describing a ‘commons’; instead, he was describing a free-for-all where there is no structural or coordinated organization of any kind (i.e., no rules). The “tragedy of the commons” is a free-for-all without community. In the real world, a ‘commons’ is in fact a bounded community that coordinates and manages shared resources in a sustainable manner. The 'commons' is a different concept than what Hardin was describing. In Hardin's essay, everyone just springs into existence and they all "go to town" as rational economic actors maximizing their own utility with a limited but open resource, which is a bizarre notion to contemplate. Except, it is the normative conventional point of view. In the essay, he was projecting his economic premises onto the world in a fictional way, but in a compelling parable.

Garrett Hardin's famous allegory of the "tragedy of the commons" has been modeled as a variant of the Prisoner's Dilemma, labeled the Herder Problem (or, sometimes, the Commons Dilemma). Cole et al. (2008) wrote a brief paper arguing that important differences in the institutional structures of the standard Prisoner's Dilemma and Herder Problem render the two games different in kind.

Oddly enough, the tragedy of the commons has been interpreted to mean that private property is the only means of protecting finite resources from ruin or depletion. And, this is a tragically inaccurate interpretation of what Garrett Hardin initially meant when he explored the acclaimed 'social dilemma' in his literature work entitled, "The Tragedy of the Commons". Therein, Hardin explicitly stated that society should exorcise the "dominant tendency of thought that has ... interfered with positive action based on rational analysis, namely, the tendency to assume that decisions reached individually will, in fact, be the best decisions for an entire society". (Hardin, 1968)

Originally, the "tragedy of the commons" argument was a reaction against (and not for) the contemporary laissez-faire interpretation of Adam Smith's "invisible hand of the marketplace". Adam Smith's laissez-faire doctrine of the invisible hand tempts us to think that a system of individuals pursuing their private interests will automatically serve the social interest. In the essay, Hardin employed a key metaphor, the Tragedy of the Commons (ToC) to show why. When a resource is held "in common" [in a market], with many people having "ownership" and access to it, then Hardin reasoned that a self-interested "rational" actor would decide to increase his or her "exploitation" of the resource since he or she receives the full benefit of the increase, but the costs are spread among all users. The remorseless and tragic result of each person thinking this way (i.e., thinking in competition) is the ruin of the commons, and thus, of everyone using it.

The tragedy of the commons has become a truism, not only in economics, but in political science and public life. The two terms (i.e., commons & tragedy) become so linked in their paradigm that there is no moving beyond them while in that paradigm.

In the essay, and in later writings, Hardin's rejection of more cooperative and systemic design-oriented solutions stems from the individualistically competitive assumptions in the argumentation for his metaphor.

Many years later in Hardin's 1998 essay in "Science", he writes, somewhat unwittingly it might be said, that in a structurally coercive society (i.e., market capitalism), the only way to save society is through a frank policy of "mutual coercion, mutually agreed upon". He goes on to state,

> *"Under conditions of scarcity, ego-centered impulses naturally impose costs on the group, and hence on all its members. Individualism is cherished because it produces freedom, but the gift is conditional: The more the population exceeds the carrying capacity of the environment, the more freedoms must be given up." (Hardin, 1998)*

It is somewhat unfortunate that Hardin's collaboratively developed and formalized method for managing the commons involves the coercive use of force. For in truth, the coercion of the State plus the structural violence of the market is unlikely to preserve anything in the long run. Hardin's misunderstanding of the situation becomes more clear in the final paragraph of the essay where he writes, "Science has been defined as a self-correcting system. In this struggle, our primary adversary should be the nature of things." There are many points that could be made here, but the three that might come first to someone's attention are: (1) any struggle against nature will always end in one's own more quick demise; (2) the market does not have to be the nature of things; and (3) "individualism" as a concept is an "-ism", and therefore, it is separated from nature and unlikely to produce the cooperative, iterative design of more free systems using the discoverable principles of nature to do so. Science is self-correcting, but science must be explored from the perspective of an emergent system.

Fundamentally, the idea that "the problem of the commons" can be solved through "government" is tenuous. The "government" can print its own money, the government can go into debt, the government's primary tool is the violence (i.e., destructiveness), and the government can change agendas - a political government is opinion-based. Are these things problems of the commons? Should we bring "organization" to the commons through coercion by government, through money, debt or force, competition, or capital, or through opinion? The idea that we need a commercially protectionist "public" entity to solve a supposed problem of common lands is likely to spawn a whole host of additional problems. Unorganized common un/ownership is not solvable through the creation and empowerment of a State of Government, which is a massive and generally unowned, exploitable and protectionist, resource.

In general, a 'commons' is a space where people have equal access to the resources and information required to fulfill their needs. A commons-oriented community represents a structure where everyone, all of the time, has the opportunity to participate in maintaining and evolving the community.

Herein, **common access** is access to resources, goods and services that are the common heritage of everyone, the property of no one, and potentially accessible to everyone.

> **INSIGHT:** *If goods are only as relevant as their use, then a system of shared and open access is most efficient.*

3.2 Commons-oriented design principles

A.k.a., Commons-oriented control principles.

What is being accessed (as resources) in community is a common heritage [of earth's resources]. Hence, when accessing a common heritage of all, it is wise to clarify a good interface (structural system) by which any individual (unit) is accessing resources; good, in such a way that the access is not harmful.

The following 8 design principles for managing the commons have been adapted from the 8 principles given by Elinor Ostrom who sought to investigate how communities succeed or fail at managing common pool, finite resources. The 8 principles outlined by Ostrom are:

> **NOTE:** *The community-type societal answer to each of these principles is stated also.*

1. Define clear system boundaries. Without exception, we all are a part of our community, and we each have an equal stake in what happens.
    A. For a community-type society:
        1. Define what is common, and what is personal (and what is team).
        2. Define the legal bounds of the commons (e.g., commons licensing).
        3. Put contribution into the commons.
2. Match decisioning protocols to local needs and conditions. Fundamentally, the things that we all have access to may be organized into a fulfillment-oriented structure, for all of our benefit. We have a mutual responsibility to take care of these commons and pass them on to the next generation in better shape than we found them.
    A. For a community-type society:
        1. Create a global survey (resources, people, needs).
        2. Create a global decision protocol that allows for locally customized configurations of habitat residency.
3. Ensure the continuation of transparency and participation in protocol creation and decisioning modification. Everyone must have the opportunity to participate in defining, restoring, and creating anything that is important to the future of the community.
    A. For a community-type society:
        1. Visualize society through [community] standards.
        2. Education society through [community] standards.
        3. Operate society through [community] standards.
4. Reduce the existence of authority structures and enhance parallel forms of cooperative creation.
    A. For a community-type society:
        1. Contribute to society through a coordinated contribution-service.
        2. Educate others about community standards.
        3. Operate optimized habitat fulfillment service systems.
5. Monitor resource usage and pollution in real-time.
    A. For a community-type society:
        1. Continuous resource survey and resource tracking.
        2. Issue-project tracking survey.
6. Facilitate restorative justice practices; we must recognize and repair the damage that has been done, and the inequities that have been created through systematic restructuring.
    A. For a community-type society:
        1. A residentation plan where people on earth can become residents in community.
        2. A restorative justice plan where people and the earth can become restored from harm.
7. Account for the possibility of disputes in the structural design of the decisioning system (i.e., design-in mechanisms for conflict resolution), and facilitate the self-efficacy and self-direction of individuals in the community.
    A. For a community-type society:
        1. A residentation plan where people on earth can become residents in community.
        2. A restorative justice plan where people and the earth can become restored from harm.
8. Define accountabilities/responsibilities and make them explicit for every systems task.
    A. For a community-type society:
        1. Contribution agreements (work descriptions, roles, skills certifications).
            i. Standards working groups.
                1. Decisions working groups.
            ii. Habitat service teams.
        2. User service agreements.
            i. Habitat residency access agreements.
                1. Habitat dwelling service access agreements.
                2. Habitat common service access agreements.

To create a commons-based (or community-oriented) society people need more than just exposure to new ideas; they need tangible ways of experiencing, practicing and living out possibilities. People can change when they see and experience a better way. To ensure the survival of the community and of our common environment, we must create new systems and structures more closely aligned with nature.

For reference only, the following are Elinor Ostrom's original 8 principles for "governing the commons" (Ostrom, 1999):

1. Define clear group boundaries.
2. Match rules governing use of common goods to local needs and conditions.
3. Ensure that those affected by the rules can participate in modifying the rules.
4. Make sure the rule-making rights of community members are respected by outside authorities.
5. Develop a system, carried out by community members, for monitoring members' behavior.
6. Use graduated sanctions for rule violators.
7. Provide accessible, low-cost means for dispute resolution.
8. Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.

It is important to note here the ways any society can control access to resources:

1. Force (State).
2. Trade (market).
3. Agreement (all).
4. Availability (all).
5. Life-phase (community).

3.3 Two forms of societal-level access

There are two paths that an access-based economic model can take:

1. **Everyone collectively owns everything** - everyone collectively owns "shares" (a 1st level abstraction) in production and/or the whole habitat; or
2. **No one owns anything** - no one at all owns any share in production and/or the whole habitat.

The most efficient of the two paths is for no one to own anything. This community has been designed along the second of the two paths, such that no one owns anything.

A community-type society is a user supported effort. We among community return resources for others to use, because that sustains an equitable economy. In some cases this "return" looks like a library return. In the habitat context, it appears as an integrated materials cycling service system.

> **INSIGHT:** *At the end of the day everyone wants to live somewhere nice, everyone wants to develop their potentials, to enjoy and share in a community of higher potential interrelations, choices, and experiences. We all want [access to] the highest service level.*

3.4 Societal-level resource ("economic") configuring

When considering an economic configuration it is important to consider the flow of decisions and information, and the existence or non-existence of an authority-driven management structure (or powered social hierarchy). Remember, herein, that a given structure will produce a given set of probable behaviors.

There are [at least] three principal forms of economic [access] distribution (or economic configuration) that a society can take. It should be noted here that a socio-economy generally includes some combination of these configurations with a leaning toward one, or possibly, two of them. For example, modern global society is composed of both political centralization as well as market decentralization, with hierarchical social power centralization occurring within the organization of the market. The access-type system described herein is more akin to a form of systems distribution involving decentralization as a "market of competing ideated designs" and not a "market of competing products". The decentralized structure involves "market sharing" (i.e., the movement of information without price) and not "market advantage" (i.e., with price). In community, ideas are shared openly and the most accurate and systematically fulfilling ones are tested, integrated, and then, temporarily adopted.

To integrate feedback, a system must have some centralizing (i.e., centralized) structure. Every decision system has a base operating code ("kernel", "rule-set") that defines what is possible; it defines the limits of the decision space. The "kernel" decides programmatically how to capture and represent objects and concepts. Centralization does not have to mean domination, as it does under market-State conditions.

The three economic network-distribution systems are:

1. **Political centralization:** One player or a small number of partnered (or federated) [game] players control the economy. In other words, there is a structurally centralized capability given to a group of entities in a competing leadership-power market (i.e., politics) for whom may be given the privilege to decide how resources are to be controlled (and distributed) in society. Centralized organizational structures focus "management" authority and "leadership" decision-making into a single "executive" unit with a bureaucracy of hierarchical and laterally competing units, with information flowing from top "leaders" (or "managers") to various lower units. In this sense, a centralized

economic structure is 'autocratic' [though it may have the appearance of looking otherwise].

In a centralized network all nodes send their data to one central node (a "server"), which may then sends the data to the intended recipient. In a system of secrecy and confidentiality, and hence, low accountability, that which happens to the data in between (i.e., at the central server) is anyone's guess. Herein, the idea of 'probable deniability' becomes formed.

Comments on centralization:

A. In centralized organizational structures decisions are made at the top and communicated down through the layers where there is not necessarily accountability. Hierarchies are not necessarily structured to maintain accountability; and, this is particularly the case in a dynamic of competition over lifespace.
B. In a centralized politically power system, the program from authority (or "policy" and legislative "regulation") is [possibly] not to be questioned.
C. Factions [of belief] and political parties tend to favor the centralization (or consolidation) of all [political] power for their own ends.
D. Centralized systems have a single point of weakness and become weaker over time due to their inflexibility to adapt efficiently. In this sense, centralized systems are always "wrong" (because of their single point of failure).
E. The centralization of power [in a social system] into a social hierarchy increases operative control while reducing accountability.

2. **Market decentralization:** Groups compete with each other [in a power hierarchy] over property ownership and for influence in a market [with varying levels of social and economic control], and they [are said to] "share" the power [by currency] - purchasing power buys influence in a lifespace of price. Decentralized organizational structures look more like multiple smaller representations of a single structure, featuring management *redundancies* and more close-knit chains of command. The theoretical "market" [without State influence] is essentially a decentralized hierarchy.

In a decentralized network architecture data passes through multiple connected computing systems. The two most common types of a decentralized network are: a mesh network and a peer-to-peer network. A 'mesh network' (or "meshnet") is a type of network architecture where each computer is connected to neighbouring computers, this is common with WiFi. Mesh networks have a "self-healing" capability — they continue to work even if participating computers drop out. As a result, the network is typically quite reliable and cannot be easily shut down, as there is often more than one path between a source and a destination in the network. A 'peer-to-peer' (P2P) network is another form of decentralized network architecture. In a peer-to-peer network, the "peers" are computers which are connected to each other via the Internet. Files can be shared directly between systems on the network without the need of a central server. And with an 'open internet' new nodes can be added as needed. In other words, each computer on a P2P network becomes a file server as well as a client. P2P is an example of a social peer-to-peer process where each individual shares resources to build a group resource.

In a sense, a decentralized network could be characterized as a distributed network of centralized networks. It is important to note that when a decentralized network is scaled or "zoomed out" it resembles a distributed network. But, zooming in on the nodes of a distributed network reveals that the nodes in the network are centralized (or "common") in their communications system and control, in some manner. To this degree, a distributed network does not rely on one single server, but splits the risk by having multiple nodes with a common means of communicating (or "controlling"). In the "market decentralized network" there are industries with their own competing command, control and communications systems [for influence over the acquisition and distribution of resources]. Hence, the market system is fractured in its decentralized distribution; it is not [a] common[unity].

Comments on decentralization:

A. It is important to note that ownership is a form of centralization (i.e., it is the centralization of resources around the "owner", as oneself separate from other selves in his/her "right" to the access and "defense" of a resource). This idea is part of the argument toward the observation that a market will always create some version of the State (i.e., political centralization). When ownership and competition are encoded into a socio-economic system, which represent its value orientation, as the system iterates over time, there will exist an increasing monopolization of that which is owned into an organization that is capable of monopolizing conflict and creating a "State".

B. When decentralized systems scale they either collapse or become seen as a distributed (or distributed-decentralized) system.
C. Decentralized organization may refer to the distribution of administrative functions or powers of (a central authority) among multiple local authorities (i.e., management or the lateral element in a bureaucratic ruler ship). In the monetary market this lateral organization is competitive, not cooperative. Yet, cooperation improves resource utilization (i.e., usage efficiency) at scale, through sharing. The monetary market reduces the coordinated utilization of resources through competition at scale.
D. Market decentralization is a reference to competition. Yet, network decentralization doesn't necessarily involve competition; it simply involves the exchange and sharing of information along a medium.

3. **Equalitarian systems distribution (a.k.a., distributed access, egalitarian access, mutually beneficial access, coordinated common access, etc.):** When individuals are both the "providers" as well as the "users" and can directly participate in the information acquisition, service design, and production and distribution (i.e., productive distribution) processes of an economy on a transparent, systems basis. Herein, no socially constructed separator exists to divide the providing creators (i.e., "providers") from the accessing users such that everyone [in the community] remains an unbiased "stakeholder". The transparent application of systems principles to the entire economic process maintains the potential for a state of equalitarian access to the distribution of economic services by the stakeholders, who are both the creative [service] providers and the service users. An equalitarian distribution system is necessarily participative in nature and founded in the idea of "openly formalized access". An economic system based upon systems distribution has attributes of both centralization and de-centralization for it is a systems-oriented form of economic distribution - it is neither based on political principles (i.e., not politically-based) nor market principles (i.e., not market-based); instead, it is based on systems principles (i.e., it is systems-based).

In a distributed network there is no central server, and each node is connected to various other nodes; data simply "hops" through whichever nodes allow for the shortest (or otherwise most efficient) route to the recipient. New nodes may be "dropped in" at any time.

A centralized system has a single point of failure. What we see with the Internet is the distributed production of knowledge, and with economic systems can come distributed computation and material production (e.g., 3D printing technology, p2p physible sharing, and even integrated permaculture). Herein, cloud-computing [in principle] is an excellent example of systems distribution (i.e., it is both centralized and decentralized). Consider a simple web-application: parts of it are running decentralized in your browser (e.g., Ajax). The data may be stored in a single data-center – centralized, but the database is replicated on different virtual machines and in different spatially remote locations – decentralized. The design of the Internet prevents it from being shut off from one switch. The web-application may make use of other services – decentralized, but provides its features via the same URL to thousands of users – centralized. Note that cloud computing is "in principle" (as previously stated) an example of systems distribution; however, cloud-computing services owned by a business entity [in the market or by a government] are still economically centralized (or monopolized) by the business entity and are therefore not an example of systems distribution at an economic scale. This is an important issues, for when social decisioning systems do not progress at the same rate as technology, then a host of unpleasant consequences emerge.

A paper entitled *Cloud Computing: Centralization and Data Sovereignty* (de Filippi, 2012) summarizes the concerns of this form of mixed [value] techno-economic system quite neatly when it states,

"The implications are many: users are giving away their content under a false ideal of community; they are giving away their privacy for the sake of a more personalized service; they are giving away their rights [to the rights of competing and leveraging entities] in the name of comfort and accessibility; but, most importantly, they are giving away their freedoms [to legitimized exploitation] and, very frequently, they do not even realize it."

It is true that shifts in values tend to follow advances in knowledge and technology, but when established and competing interests are involved, then appropriate value shifts can be suppressed for competitive leverage and protectionism [of a power base] to the detriment of all individuals in a society. A distributed system is "centralized" only in the sense that the system keeps track (or trace) of information on a comprehensive habitat-community system basis and information transfer protocols are standardized to allow for the very transfer of information. A unified distributed system is capable of communicating and transferring (or relaying) information between its component parts. The standards for communication are "centralized" (i.e., the same across the whole of the structure) -- functions are centralized. This is, by the way, why you can view a website that may be hosted in Brazil and not have to translate protocols (or standards) manually. One could equate the "centralization" present in a systems-distributed configuration to a stream, which runs in all directions equally and with the same "laws". Hence, a more accurate term for the type of "centralization" described herein might be "coordinated design standardization".

Decentralization can exist at the distributed level also. For example, oil, coal, natural gas, and nuclear industries are highly centralized providers of energy as electricity. Solar, wind, and to a lesser extent hydro, geothermal, and biomass, can be localised and provide the energy requirements of a community that seeks to use them at a distributed level; and therein, the energy derived from these sources could be laterally decentralized into a series of backup batteries.

Comments on systems distribution:

A. On the planet today, humanity now has a methodology for massively paralleled distributed design and production.
B. Distributed horizontal arrangement among cooperating and trusted entities versus a pyramidal or hierarchical "scheme"-atic structure. A distributed system is not "run from central command". A Community is a dynamic fulfillment system designed by its users and run by its users. Access-based systems are naturally distributed in their nature.
C. In a distributed configuration all the nodes can connect to each other; there are no centers. New nodes can enter at any time.
D. Distributed interlinking reduces the potential of [competitors] playing one social service against the other.
E. A systems form of distribution is community-global in scope (i.e., unifying); whereas a political configuration is factional in scope (i.e., divided) and a market is inter-factional in scope (i.e., more divided) -- political affiliations are divided by State nationality and then party affiliation; market affiliations are divided by industry, business entity, profession, lifestyle, and also, national/international affiliation.
F. In a distributed self-organizing system all the elements are, by definition, autonomous: there is no leader that drives the organisation of the system.
G. Redundancy and multiplicity is efficiency in the network world.
H. A distributed system is less likely to encounter system wide blackouts of information, energy and service; its networked design configuration makes it is less vulnerable to natural and man-made disasters – which can be in the form of malfunctioning, natural disaster, or attack. In concern to energy, when localization is applied to such a configuration, it allows for a minimization of energy loss by avoidance of large distances between energy production components and energy usage components.
I. Naturally, as information becomes more available and distributed, then an access-based model becomes more probable.

The following are several notes on economic configuration design:

1. One may also speak of the idea of centralization in terms of outcome(s) and vision. Therein, a "centralized" outcome might be seen as the 'purpose' of a specific system or structured organization. Yet, in the case of the Community, the term 'centralization' seems inaccurate and inappropriate, for the purpose for the Community's existence is in fact emergent in its semantic form; and its orientation is distributively adaptive to its environment.
2. The Internet, by definition, is centrally planned in the sense that it has relays, common technologies, and standardized protocols (e.g., http, ftp, arp, smtp, tcp, and the future spatial web). In other words, the Internet utilizes a set of shared, common and centrally developed standard protocols. Without these "central" and commonly designed systems information could not pass from one end point to another. Herein, the centralization is in the systems logic, which allows for systems

to communicate effectively and efficiently with one another. There is a fundamental difference between political centralization and systematic design centralization.

3. In a self-organizing system the control is distributed [amongst the localized actions of individuals], and all parts of the system contribute to the emergence of the system's organization[al behavior]. The system's resulting behavior is a result of the numerous interactions among the system components.

Fundamentally, humankind now has a methodology (i.e., the systems methodology; systems architecture) for massively paralleled distributed design and production by users for users [without the addition of politics or the market]. Herein, an economically distributed system is "centralized" only in the sense that the system keeps track (or trace) of information on a comprehensive habitat-community systems basis -- information and processing are systematized, distribution is distributed and decentralized, and production is localized where technically possible.

Note, there exists a point of confusion amongst defenders of the market system that in criticizing the decentralization of the market, one must be advocating for [authority-driven] centralization in another form. In the free-market thought paradigm, if you criticize market-decentralization, then you are for socialist-political-centralization -- there is no other option that can be computed in the paradigm; hence, a false dichotomy is created and the idea of the "economic calculation problem" arises (or is reinforced).

An access-based system represents a move from owning one of everything to a larger economic system designed for access to goods and services as needed and otherwise desired. The so-called "sovereignty of ownership" is a distortion of the reality of the situation. If John Locke were alive today and understood systems thinking then he might quietly be revising his claim that liberty cannot exist without private property. Truly, the understanding is arising that ownership (Read: external restriction on a particular good, service, or other lifegrounded form of individual need) is not in fact itself a "right", but that ownership is in fact the resulting behavior of a technical limitation of the ability to access said good or service in any other way. Before networked computing, the possibility of a community city was impractical.

A great deal of wealth exists when resources are coherently organized and made available. Herein, information acquires greater coherency and solutions become more transparent when life is shared. And yet, it is important to remember that in early 21st century society there continues to exist industries and establishments that benefit off of the back of a structure of restriction, scarcity regeneration, and the division of unification.

An egalitarian [strategic economic] design is one of the few economic designs that has the potential for providing a high-standard of known living (i.e., a high quality-of-life) to an entire community's population through the recognition of commonality among humankind (e.g., needs and environment) and organization based upon cooperative coordination. In other words, this system is designed to strategically provide for the greatest fulfillment of everyone's common needs and individual preferences (among the whole community of individuals in a systematic manner), and not the greater/est good for the greater/est number, which often leads to political systems and a tyranny of the majority.

3.5 Access sharing

At the core of the access system is the Earth, the common heritage, which is an existing "thing", a complex interconnected systems "thing" that sustains us all. The sharing of knowledge about this "thing" and our relationship to it is essential, not just for the Community, but for each and every one of us as an intrinsically motivated individual. Therein, the sharing of information and of access comes naturally from a common perception of connection to nature, and it creates the potential for community. Wherein, the persistence of a community necessitates the sharing of knowledge and technical ability to maintain fulfillment and optimize well-being.

The idea of accessibility [to a service or a good] carries both a spatial and temporal nature. In other words, access can be sub-divided into spatial elements and temporal elements, and in logistics these factorial [data] elements are modeled together in what is known as a spatial-temporal model of the engineered [logistical] service system. In other words, time and space form an 'accessibility dynamic' in the engineering of an economic system for service fulfillment. It is important to note here that most, if not all, "living" self-organizing systems express such dynamics [that create different 'emergent behaviors' as the system changes over time].

Socio-economic systems have dynamics that are strongly correlated and coordinated in space and time, and all typically display a multiplicity of spatial [localization] and temporal [prioritization] scales, dependent upon their drives, values, methods, encodings, and possible paradigmatic assumptions.

Therein, a distributed and integrated economic system may be said to be composed of interacting spatial networks representing a mixture of individuals and technical computing systems, each having (1) one or more inputs, (2) an internal state variable $x(t)$ that evolves in time in response to inputs, and (3) one or more outputs. In the case of individuals, we are highly complex living systems and at a very basic physiological level we have inputs, processes and outputs, which should not be taken to purport that as embodied beings we are mechanistic in the totality of our nature. In the case of computing systems, there are many different kinds of computing system from development systems to integrity testing systems; wherever computer processing occurs [spatially] there is computing [in iterative time, Δt].

In such a system, material goods and service structures have a spatial location that you can point to and say, "that is a car, which is part of this transportation network that includes both people and computing hardware as well as a material infrastructure of which that road is a spatial part upon which there is transport at some frequency". Processes and organizational services maintain a primarily [iterative] temporal nature; they are purely information systems, the representation of which for computing systems may be said to be the electron and for embodied consciousness it may be said to be the body. Just like the ledger of a digital blockchain (e.g., bitcoin), each state of the economic system is modeled and distributed in time. It may be said of a particular service, once the information model is visualized, that it had "this" *specified* organization at "this" *specified* point in time, designed for "this" *specified* functional purpose with "these" [negative feedback] consequences. In essence, services are temporal, spatial, and conceptual information organizations.

Herein, service systems are strategically designed for access, which enables the modeling of the utilization [of resources as they move through a service system] based on actual use time. Along with data on actual demand, the patterns of use of any given service/ good may be analyzed to determine how regularly (or intermittently) it is being used (or accessed). Transport vehicles, recreational equipment, project equipment and various other genres of goods are commonly accessed at relatively distant time intervals, making the task of ownership not only somewhat of an inconvenience given the need to store these items, but also clearly inefficient in the context of true economic integrity (i.e., an economic-orientation that seeks a reduction of waste at all times). If properly configured, an economic system based on access and the efficient allocation of natural resources would maximize societal benefit per unit of natural resource.

In the Community, users are designers and designers are users; everyone is a "stakeholder" and everyone knows it; they don't have to be conditioned to believe it; instead, they are intrinsically motivated to experience it. Wherefore, if there is a weakness in the economic logistical distribution system, then everyone has an incentive to fix it. A decision system designed to generate systematic access must substantially share information and problems, it must organize transparently, formally, and in a person-independent manner.

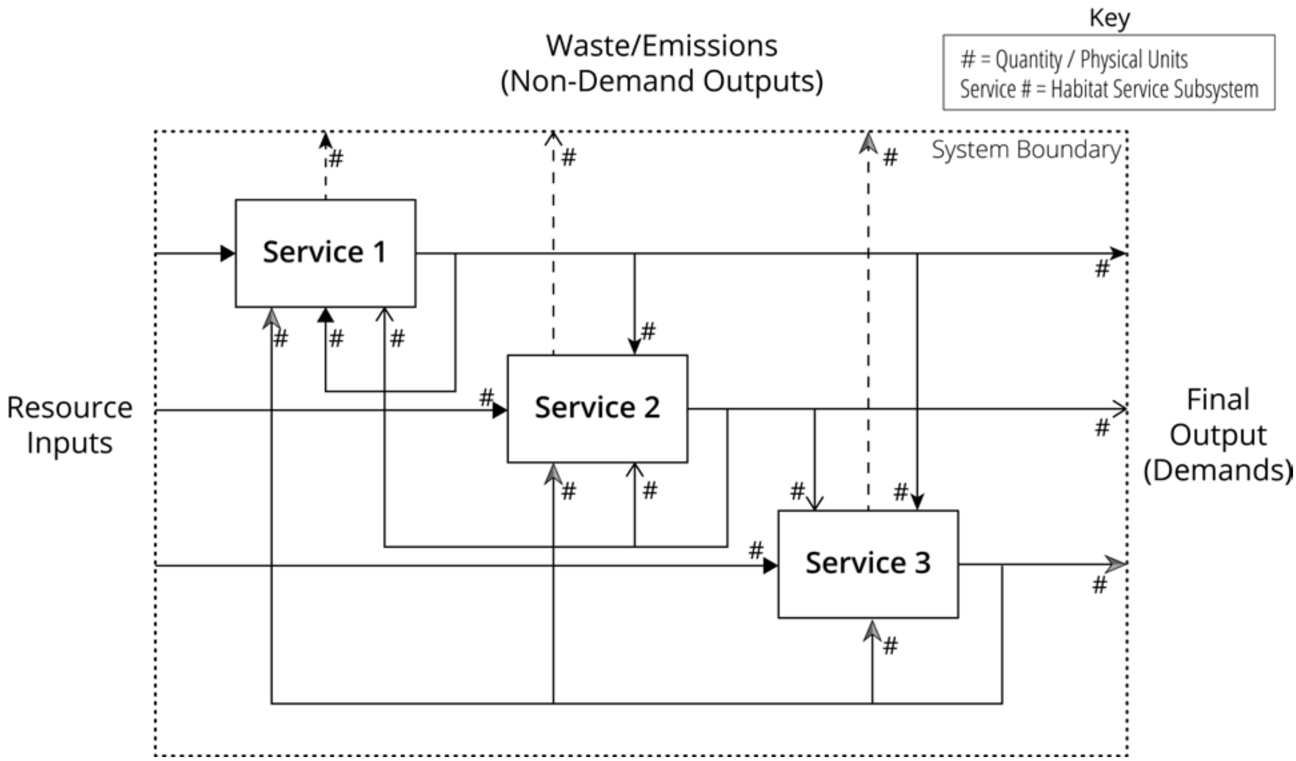

Figure 12. *Conceptual framework of an input–output system. Three service systems are shown. These service systems take in resources (left system boundary). The service systems have two outputs: non-demanded outputs that are a byproduct of the service systems processes (a.k.a., wastes/emissions); these are connected to the top system boundary. These wastes/emissions may be inputs into other service systems, or they may be recycled or disposed of. Then, there are the demanded outputs of the service system (a.k.a., final outputs); shown at the right system boundary. (Tan, et al., 2018)*

INSIGHT: *A distributed system distributes information over space and time, and in so doing it becomes increasingly resilient.*

3.6 Access-based in comparison to property-based

MAXIM: *Nature becomes disconnected through ownership. Property disconnects social relationships. Profit disconnects self-relationship.*

An access-based model exists in contrast to an ownership-based model (i.e., property-based model). An access-based model is a more accurate conceptual model of the real world, involving the verifiable observation that all physical resources are, in actuality, transiently accessible in nature. Conversely, "ownership" is a social construct and exists outside of the nature of the real world where access is universal. The encoding of the socially constructed idea of "property" into an economic system establishes destabilizing systems properties where useful and accessible objects that are actually transient in nature (i.e., natural resources) become the exclusive access and use of one entity. In a system, the encoding of the idea of "property" corrupts and obfuscates feedback. Hence, property-based systems are unable to re-orient themselves effectively. Such systems are essentially unstable like a three-dimensional twirly top oscillating until finally it fails-over; they are not self-stabilizing like a regenerative gyroscope.

Empirically, there is no such thing as ownership, there is only access, and in the real world access is of an incrementally temporal nature (i.e., it involves time; Δt). Essentially, in the existent real world there is no such thing as property, there is only access; yet, individuals can socially agree (or be forced into accepting) a property-based model. The very idea of 'property' can subjectively filter perception and encode itself into a society's socio-economic system, but that doesn't mean the concept accurately reflects the 'access' that is occurring.

The notion of 'property' as self-owned or self-ownership and all that ownership entails, such as private property, is obsolete under the structure of an access-based system. The more factual idea of 'access' makes private ownership obsolete.

In an access-system an accessed item can be returned at any time for re-processing through the community's system. In a property-system an item of property is transferred and exchanged; hence, the idea of systematic resource re-processing (e.g., cradle-to-cradle design) is difficult if not impossible to effectively organize due to the transfer of responsibility through property exchange.

Ownership establishes a boundary to the most efficient coordination and re-processing of resources within a life system. If an organism, which has a supra-system perspective, can no longer allocate resources systematically because its intra-systems have ownership over interdependent resources, then the organism will no longer function optimally or remain in a state of dynamic and healthy equilibrium with its environment. Instead, a system of competing interests has been established and the life system enters into a state of decay. **Optimal decisions** in an access-based model are decisions about the allocation and occupation of interdependent resources that are coordinated to serve the homoeostatic functioning of the organism and the continued persistence (or purpose) of its existence.

Access to items when they are needed releases individuals from the property-based requirements associated with individual ownership of items. This may not appear to be a "big deal", but when accounting for all of the factors that ownership entails, it becomes highly relevant to a community's economic model. In a property-based (and free-market) model, ownership of an item transfers responsibility for that item from the producer to the owner. Under regulated market conditions the producers may still have ownership over the items they produce even after their commercial economic "sale" (or exchange/gift) to consumers (e.g., copyright and the U.S. Digital Millennium Copyright Act). Under hypothetical non-governmental free-market conditions, the consumer (or new owner) becomes solely responsible for the items storage, safety, transport, maintenance and recycling/disposal, among other functions associated with "responsible ownership" – someone "taking care" of their belongings (with degrees of incentive). In contrast, under an access model, the community (including human activity & machine activity) optimizes the fulfillment (or coordination) of these responsibilities, not any single individual or social group (class, nationality, or race). An access system is a system of and for mutual benefit. A property system benefits those with property and those with access to property (including, inheritance and gifting).

In practice, ownership acts as an external restriction on a resource, good or service. The concept of ownership exists in part due to the social and technical limitations of a society to provide flexible access to needed goods and services in any other way.

Someone who is owned is by definition not free. If someone's labor is owned in the marketplace, then that someone is by degree not free. It is an intellectual dodge or cheat to claim that the market is a place of freedom when there is ownership, and in particular, ownership of labor. It is quite clear that if someone can labor for "you", then they can labor for themselves in a community, without having to change bodies or change minds or make any fundamental change to who and what they are and how they operate in the world. They can go and do for themselves and for their community without ownership.

Ownership is not a real limitation of technical feasibility, it is a deliberately introduced constraint, which compromises capability and subordinates it to some other concern. In many cases that primary concern is "profit". In the digital economy it becomes the "piracy of intellectual property". Sometimes it even involves a deliberate breaking of the hardware -- broken (i.e., functions disabled by the "landlorded" business) and purposefully placed behind an "ownership" wall.

Ownership structurally de-incentivizes accountability for socio-ecological viability as it is inherently a structure that generates opposition (i.e., competition). To be remain viable in a system (e.g., the earth's bioshpere) we must accurately sense our environment. When we come together in villages, towns, and cities, we must accurately sense our environment at not only the individual level, but at the socially networked level also. In other words, we must be precise in our decisions so that our structures and behaviors align with regenerative sustainability as the population scales. If we scale without retaining a fulfilling alignment, then we risk our viability.

Ownership isn't a 'first principle'. You own something so that you have exclusive and unlimited 'access' to it; thus, access underlies ownership, and this is what an access-based system seeks to optimise, shared access (not the divisionary construct of ownership).

Further, any claim of ownership within a system, particularly a biological system, will cause the entire system to become unstable. If system entities begin "laying claim" to resources (as those substances that allow for its continued existence), then the system will eventually cease functioning in a stable manner from competition over resources that would otherwise be allocated and occupied in a systematically and strategically coordinated manner for the system's purposeful survival. And therein, the authority of the day will determine how rightful things are, how liable its participants are, and how much force to apply to modifications to the concept of "property ownership".

Also, individual ownership is inefficient within a community. Ownership, more than anything, is the personal burden of transport, maintenance and storage, and of disposal. In an access-based community needs are fulfilled cooperatively and through strategically efficient design, leading to a minimization of repetition, duplication, stagnation, deterioration, the non-use of a useful thing, ecological pollution, and waste & decay.

Ownership is [in part] characterized by the concepts of **liability**, **rights**, and **force** (and **trade**, as the processing element). Ownership involves the right of a claim, a greater claim than someone else [often through a "public" or higher authority]. Life becomes a spectator sport, a box. Ownership involves personal liability between players in the game of ownership. Ownership requires force to prevent someone else from claiming ownership. Force is a characteristic of ownership, and not necessarily a characteristic of the concept of 'access'. A property-based model is by its characteristics a force-based model; force is required in defense of property [from that which is referred in a property-based paradigm to as "theft of property"].

> *"The notion of "rights" is inseparable from the history of "property" or privatisation of nature, resources, processes, knowledge, and so on, for appropriation, consumption and control by the powerful, who can take possession of objects by force, excluding others."*
> *- Farhad Mazhar (Mazhar, 2007)*

In the German language, there is a saying, "Property comes with duties attached to it (e.g., something owed in return; responsibilities; tax; upkeep)." Except ... in a free-market it doesn't, and in a regulated market the duties are backed up with force (and threat of violence) by the State.

Any ownership over resources, individually or socially (as in "public property" managed by government), will eventually lead to the establishment of authoritarian force-mechanism constructs -- a paradigm wherein force is claimed to achieve right and proper[ty] action (as in property rights). Behind all *liability* and *property rights* there exists force. Therein, power fills in all the crevices where power is given over to another to apply through coercion or contract[ed negotiation].

Commercial researchers, for example, are highly likely to race to take credit for research-led therapy that increases survival, but not so equally attentive to the possibility of harm or the retraction of statements that were once accepted when later analysis shows harm or fraud. Commercial researchers are often not so attentive to retractions due in part to the issue of liability. In competition, liability is seen as a potential weapon (a variable in market gaming strategy).

For the past three hundred years or so, industrialised societies (or at least the class of tangible property owners within them) have become increasingly preoccupied with property, its privatisation and its protection - in the

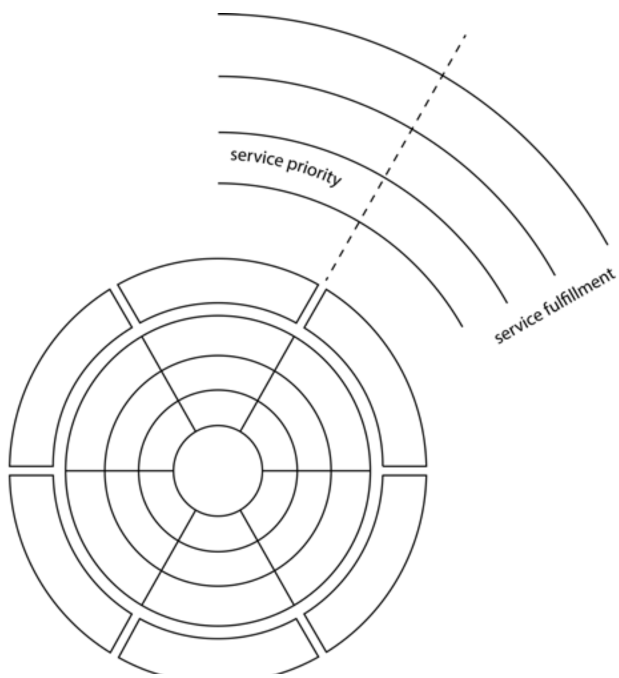

Figure 13. *Concept diagram depicting service systems with service priority (i.e., some services are prioritized) and service fulfillment (accountable degree of completion of service system demand).*

form of the accumulation of capital and financial control. The historic debate about property ownership has been framed as being between enclosure and commons as between "private property" and "public property" (governed by the State). Therein, the ideology of personal (and now corporate and governmental) greed has become the unquestioned driver of "the economy", with its assumption that humans are motivated only by the prospect of infinite acquisition, and that progress results solely from increased production (or productiveness) and consequent, infinite economic growth. Such an ideology is quite out of alignment with the reality of fulfillment and *how a common habitat area might be organized into accessibly coordinated service systems that fulfill a community of individuals.*

It might be interesting to learn how 'property-based' terminology is being and has been redefined over the centuries to include ever more of that which exists in the real world, and one might start with Roman Property Law. (*Roman Property*, 2020) There are at least 5 general categories of "public property" that have been redefined as private property: Res nullius; Res communes; Res publicae; Res universitatis; and Res divini juris. A property-based system incentivizes "property owners" to further spreads their market demand more deeply into that which naturally exists in common.

Many of the social and economic concepts in modern parlance are terms of a property built world. Under an access model an individual could neither be said to "steal" nor "sell" nor "pirate" items that no one owns. In other words, the concepts of "stealing" and "selling" have no meaning in an access-based system. Personal property is sacrosanct in highly materialized/materialistic commercial cultures. Even in their work environment, with equipment allocated / issued by an employer, people can have a strong identification of something being theirs, which might be epitomized in the common office statement, "can I borrow your stapler". We must be careful of the language that we use because it shapes social and economic problems.

> *"I'd be a bum in the street with a tin cup if the markets were efficient."*
> *- Warren Buffett*

3.7 Induced demand

In the market-State of the early 21st century, production is primarily driven by the pursuit of profit rather than meeting genuine human needs. The capitalists producers produce products and services, which they take to market to sell. Buyers then look at what is available, at what price, and then, make their purchases. Rarely, do the end-consumers place orders for products prior to their production (Read: pre-orders, white-list orders). In other words, in the market, access is generally considered to be accounted for after production (Read: post-hoc, post hoc, ex post, a posteriori, etc.). The capitalist produces, and then, must induce demand from the public. That induced demand may be for something that is actually needed and desired, or it may be a manufactured desire (without genuine human need) for the profitable benefit of the producer. Additionally, in the market-State, most people find out about products after they are produced. In other words, after production, the producers have to induce demand [for the product] in the population through marketing (propaganda).

As a result of producing without directly surveyed demand, there is a tendency for capitalist production to generate more goods and services than are wanted and can be absorbed by the market. This leads to a situation where there is a surplus of commodities that cannot be sold profitably (i.e., overproduction). Overproduction refers to a situation where the production of goods and services exceeds the demand for them in the market. It is closely related to induced demand, as it highlights the contradiction between the necessity for profit (in capitalist production) and the limited purchasing power of consumers. To overcome this overproduction crisis, capitalists employ various strategies to induce demand and stimulate consumption. These strategies include advertising, marketing, planned obsolescence, and other manipulative tactics aimed at creating artificial desires and needs among consumers. Induced demand reflects how production in the market-State, driven by profit motives, generates imbalances between production and consumption.

> **NOTE:** *Commodities are products (and services) specifically produced to be traded [for profit].*

In a community type configuration of society, access is engineered, starting with user requirements (genuine human needs). Needs and requirements (including strategic preservation protocols) are taken in before production (Read: ex anti, a priori, etc.) and composed into master-plans, which are then executed, produced and operated, for some cycle of time. In community, production is flexibly planned beforehand, and people have some idea of what they are going to, and expected to, consume (with flexibility) over some production cycle of time.

3.7.1 The manufacturing of demand

Early 21st century society has become a lifestyle of unnecessary spending deliberately cultivated and nurtured in the public by economic establishments (i.e., businesses and States). Companies in all kinds of industries have a huge stake in the public's penchant to be careless [with their thinking, their money, and their resources]. Soni and Upadhyaya (2007) carried out a study on what effect the nagging of children had on their parents' likelihood of buying a toy for them. They found out that 20% to 40% of the purchases of their toys would not have occurred if the child didn't nag his/her parents. Similarly, one in four visits to theme parks would not have taken place. Industry markets directly to children, because industry knows that it encourages them to nag (pester) their parents to buy them the advertised products and services.

> *"You can manipulate consumers into wanting, and therefore buying, your products. It's a game."*
> *- Lucy Hughes, "The Nag Factor"*

These are only several small examples of something that has been going on for a very long time and to which we have become 'normalized'. Enterprising businesses didn't make their vast financial wealth by earnestly promoting the virtues of their products; they primarily made it by creating a culture of billions of people that buy way more than they need and try to chase away dissatisfaction with money.

Marketing campaigns exist to manufactured demand. In part, advertising exists to implant in "you" new desires that "you" may not have had before. Therein, advertising tells us that happiness is at the end of our next purchase. Advertisements are paid endorsements.

To add to the confusion inherent in early 21st century society, marketers give names to products and services that have nothing to do with their function. Marketing always comes down to one thing, perception; it is not about your product or its features. It is a very deceptive way of looking at things. Marketing is all about how others understand your product, not how you understand the product. (Ries et al., 2009)

Marketing follows the same principles as propaganda. One is done by the State and political candidates, and the other is done by businesses. There is corporate and political marketing, which are synonyms for corporate and political propaganda. In both cases, marketing exists to manage peoples' emotions and perceptions. Special interest groups and entities in the market are continuously rolling out unseen narratives designed to manipulate opinion. Therein, advertising becomes the act of amplifying opinion by paying other people to repeat that opinion. Simply, advertising is being paid to say something. Advertising is a form of persuasion that can be made increasingly effective until it reaches a critical point, wherein if used improperly can enable the group that wields it to manipulate and hijack an entire civilization.

There are countless euphemisms used in early 21st century society for propaganda, including but not limited to advertising and marketing, lobbying, public relations, public diplomacy. Propaganda employs a lot of people in early 21st century society. And yet, in early 21st century society, they don't see it as propaganda; instead, they say things like, "we are educating people", "we are providing them with information", which is misrepresentation, and makes it extremely effective. Because, propaganda works best when you don't see it for what it is (i.e., when it is sophisticated). "White propaganda" announces itself as propaganda, and "grey propaganda" that disguises itself as journalism or product placement in movies. Fundamentally, propaganda assists people in deceiving themselves.

> **NOTE:** *Propagandists, instead of questioning authority, they question those who question authority.*

Industry will take every opportunity to sell more [stuff]. Retail stores are well known to apply scientifically backed strategies to make it more conducive for a [potential] shopper to spend more. Retailers purposefully modify the shopping experience to make it more likely that those inside their store will spend money. The .99 versus 1 dollar is just one example. Therein, proven methods of manipulation are used to drive sales and profit. Just moving products around a store to locations that are easier to access or more visible increases their sale. In other words, whatever the manufacturers put in certain locations correlates to an increase in their sale; and this is why they pay the retailers "slotting feed" to put their

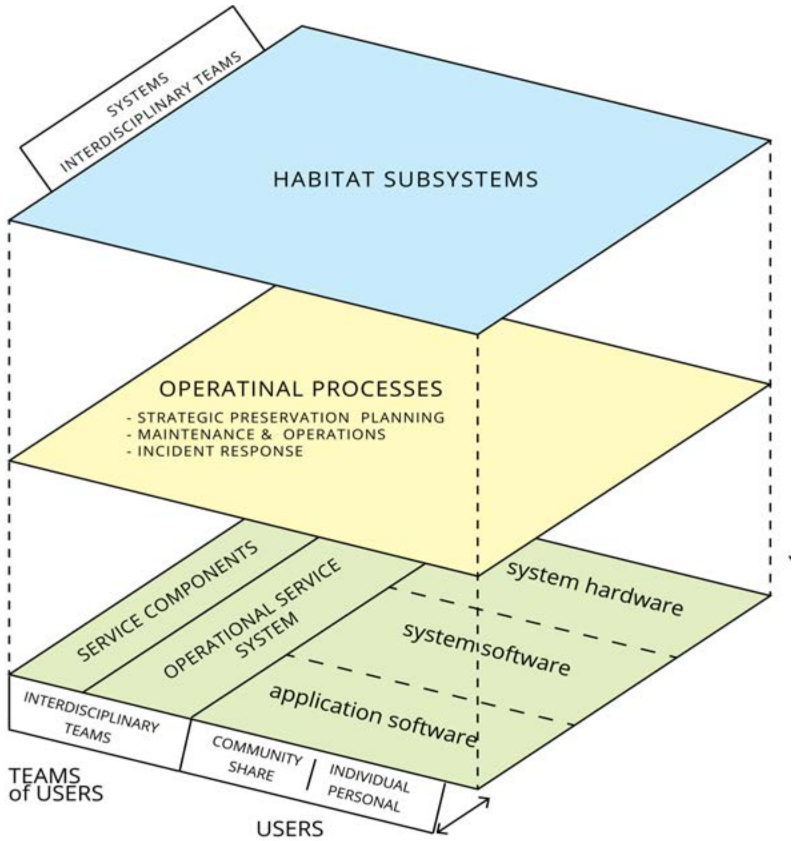

Figure 14. *Habitat service subsystem decomposition model.*

products in those prominent places.

Consumer preferences are shaped to meet industrial needs by advertising. Sophisticated and manipulative advertising techniques exist to convince people and to normalize harmful ideas and products.

The medium for the idea of humans being broken is marketing, which sells people things to fix their brokenness. Yet, it is not humanity that is broken, it is the society structures around humanity that are broken for human fulfillment.

Often, individuals buy objects to cheer themselves up, to show that they have as much money as others, to fulfill their childhood vision of what their adulthood should be like, to broadcast their status to the world, and for a lot of other psychological reasons that have very little to do with how useful a product really is.

One marketing strategy is to discover what people want in a particular product offering, and then market the product based on that information. Hence, the order of events is:

1. The product is developed.
2. Discover interest for the product.
3. Market interest (which is a double entendre).

Therein, selling is the method of identifying, intensifying, and supplying:

1. Identify the target and their context.
2. Intensify their lack - manipulate into deciding to consume even more of something.
3. Supply the demand.

In the market, once the immense accumulation of commodities are produced, they must also be sold. A market entity can't just produce things and not sell them. For commodities to lead to profits for producers, they have to go through the circuit of production, distribution, and consumption. Investment must be converted back into money and profit.

Therein, advertising creates a culture in which desire and identity are to be fused with commodities. The lifestyle of those in early 21st century society has become choreographed by marketing entities competing for profit.

The right question to ask is not whether this or that ad sells what it is advertising, but what are the consistent stories that advertising tells as a whole about what is important in the world, about how to behave, and about what is good and bad? In fact, we must inquire into values. Which values does advertising stress? And that's not just one ad, but across the whole range of advertising.

It could, therefore, be said that advertising should be treated as a cultural system; a system that impacts how human beings make sense of the world, how we understand its meanings. So the images, the values, the ideas of advertising are lodged inside us because that's the way all culture works. To not be influenced by advertising would be to live outside of culture, and no one lives outside of culture. We are all influenced by advertising to some degree.

Every society has to have a story about happiness, of how we can become happy, what we should strive for to be happy. And, the advertising system gives everyone a very specific answer to that question for their society. Advertising tells the receiver that the way to happiness and satisfaction is through the consumption of objects. Commodities will make us happy. In one sense, that's what every single ad tells us. And, when consumption is so central to the way that the economy functions, that shouldn't come as a surprise. The immense accumulation of commodities has to be sold, and it is sold through the story of goods bringing happiness.

A culture dominated by commercial messages that tells individuals that the way to happiness is through consuming objects, gives a very particular answer to the question "What is a society?" What is it that binds us together in some kind of common way? In fact, Margaret Thatcher, the former conservative British Prime Minister, gave the most succinct answer to this question from the viewpoint of the market. She said, "There is no such thing as society. There are just individuals and their families." That is, there is nothing solid that we can call society. There are no group values, no collective interests. Society is just a bunch of individuals acting on their own. And, in fact that is precisely how advertising talks to us. It addresses us, not as members of a society talking about common issues, but as individuals. It talks about our individual needs and desires. It does not talk about those things we have to navigate commonly, things like poverty, health, life-support, and the environment.

Fundamentally, demand can be manufactured, and it is the labor role of market psychologists to scientifically maintain and increase (where possible) sales for the business of industry. One could even say that the monetary-market socio-economic system itself [through the encoding of its value orientation] manufactures the "need" for, and then the demand for, money. Therein, the word "need" is in quotes because money is not what is actually needed. Money is an abstract 'mediator' [between competing players].

Instead of creating a dynamic of increased efficiency and effectiveness toward freedom and fulfillment, early 21st century society has internalized the idea of object acquisition and of productivity to such a state that it has caused a neurosis of production and a psychosis of consumption. The consumer vision that is pushed by advertising, and which is conquering the world, is based fundamentally, of course, on a notion of economic growth. More consumption requires more production. So it is pushing industrial production. Now, industrial production has costs. It requires resources, raw materials, and energy, and there is broad consensus among environmental and logistical researchers that the Earth simply cannot sustain present levels of economic expansion.

It is unwise to ignore the purpose of industry. Every industry wants to maximize profit (i.e., sell more stuff). Industry has no goal or responsibility to maximize fulfillment. Attempting to evolve an industry is like attempting to give a regular pet feline a bath: what is the expectation that it will evolve into, and further, you will get cut and slashed in the process. Similarly, re-directing an establishment is like re-directing a supertanker -- it takes significant time as well as a functional engine and navigational structure designed to re-direct the system toward a newly built point-of-focus (e.g., the community).

Some societies create conditions that are intentionally hostile and cause individuals to act in ways that are not in their best interests. For example, in the market, businesses sell people more than they need, they sell them food-like substances and other products that cause disease. Some environments are actively trying to make and otherwise persuade people to be unhealthy and act against their own best interests. Therein, healthy and intelligent behavior requires individuals to recognize their environment as being hostile, and that can be psychologically painful. It is, generally, psychologically painful to come to recognize that one's environment is hostile to one's well-being. Because, people want to believe that the smiling face on screens, behind podiums, and in stores have their best interest at heart.

> **QUESTION:** *What might a societal system look like that actively attempts to make people feel dissatisfied with their lives?*

3.8 Responsibility and access

A.k.a., Access responsibility.

NOTE: *If we don't interface with things responsibly then we don't have quality things.*

An access-based model requires a shift in an individual's perception of responsibility from the idea of responsibility as described within a property-based system. The responsibility, the will and the intention, to "take care of" and to maintain systems, goods and services, is different between the two models. In the access-based system, "you care for things you use, but do not personally own". Generally, under a property based model, the statement is, "you care for the things you own (or don't care because it doesn't really matter as you won those things), and it is a sign of virtue to care for the things of others when they are in your possession"; and the incentive to care for the things of another comes in the form of punishment if they are not cared for. In other words, the later part of the statement generally carries a force mechanism caveat (or qualification), "If you damage someone else's belongings, temporally under your possession, then you must repair or replace that item under threat of your own property or freedom."

If society is not composed of property and no one

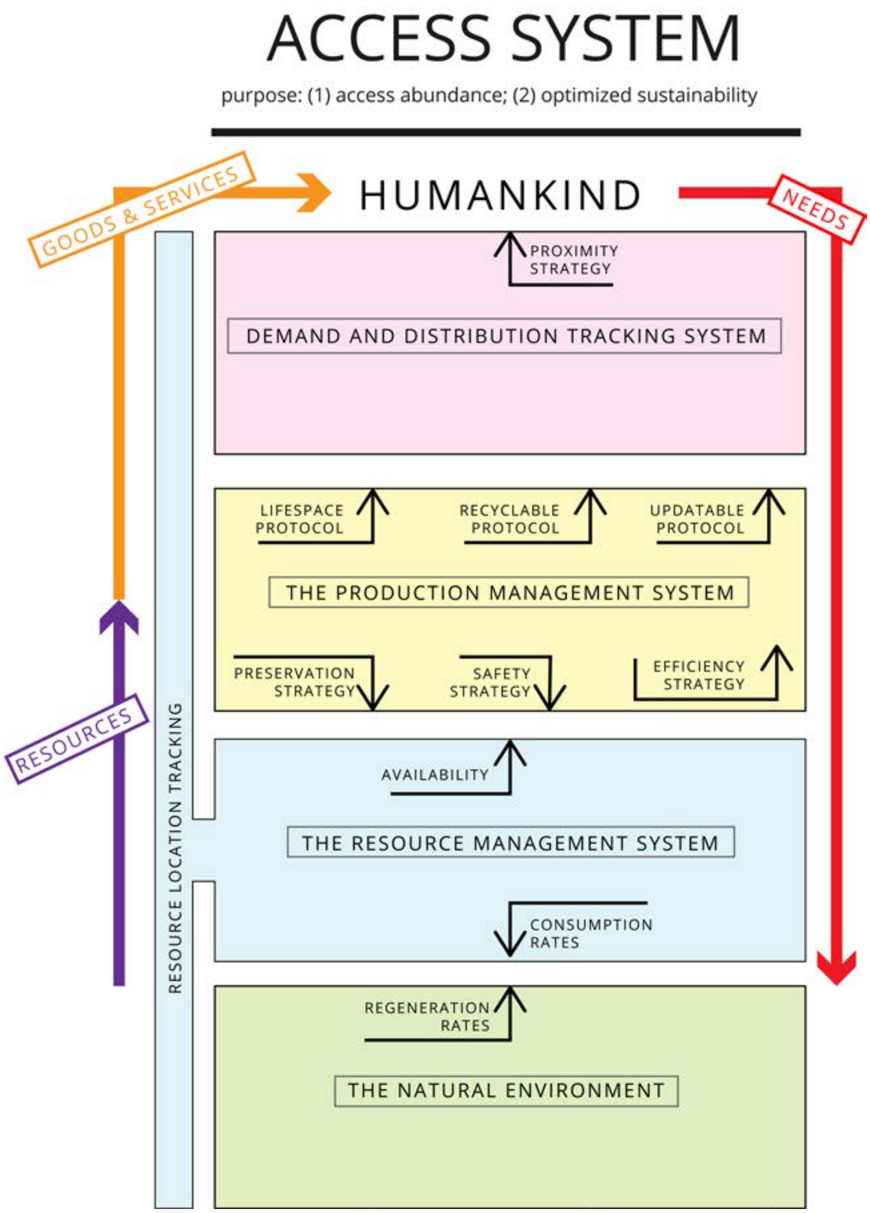

Figure 15. *Resource tracking within an access system.*

owns a "thing", then the question quickly arises, who takes care of society's things? In an access-based system this question initially becomes one of individuals' values and their orientation toward themselves and the community as a whole -- we take care and we design systematically efficient and integrated services that take care -- we respect ourselves, we respect others, and we design systematically integrated services that are respectful. Technically speaking, in brief, systems can be designed with greater maintenance efficiency and operational integration so that less energy and effort is required to maintain society's things. Yet, to sufficiently answer this question in full the whole of the Community design must be detailed and understood in full from the social and decision systems to the learning and architectural systems. The community detailed herein is both intentional and integrated; and hence, to understand how things operate in full the whole of the design must be observed and taken into account. Wherein, in community, access occurs with a basic sense of social responsibility (per the Social System design). A society designed to facilitate our fulfillment as one, so why should we not take care of society in return? Community requires individual participants with a commonly directed value orientation.

> **QUESTION:** *The idea of 'ownership' has a double meaning. It refers to that which "you" own and that which (or whom) owns "you".*

3.9 Wealth and access

When the idea of 'wealth' is defined as **use** and **access** rather than as possession, then we could cut down on our delusions. If we seek to fulfill our non-material needs with material purchases, then, "we can never have enough". Our needs for family, friends, community, and a purposeful life get put off while we work hard to pay off the debt from purchasing all those things that were supposed to make us happier in the achievement of ever greater reward. The less time we have for meeting our real needs, the more needy we feel, and the vicious cycle continues. A monetary (or consumer) definition of "wealth" makes our hunting and gathering ancestors the poorest people on Earth. Maybe poverty shouldn't be defined by the market or by the State, but by access to real world [heritage] resources and services, and ultimately, our sense of an integrated, flowing, and fulfilling life experience. Maybe, 'wealth' is affluence in the naturally serviced fulfillment of our needs. Perhaps 'wealth' is how much of our time we can say we control, the ability to self-direct the fulfillment of our needs and our access, the participation in something we truly consider to have meaning and importance.

The term 'wealth' could in fact mean **accessibility**; accessibility to the highest quality known and available good or service at the time it is known about and desired. Am I wealthy enough that I have access to what I need and want in the most timely and efficient manner? Isn't this really what 'wealth' means - having access to things and participatively contributing to service processes. Herein, there is no property/commodification/commercialization process, what there is is access[ible design].

> **INSIGHT:** *The competitive market system creates an environment where "success" is the building of enormous financial wealth for one's isolationary and infinite commercial wants at the cost of true wealth for everyone.*

3.10 Zero-sum games and access

This equitable access-based model does not maintain the qualities of either "sacrifice" or "zero-sum" (as in "the zero-sum game"). If one individual or group has access to a resource, it does not have to follow that another individual or group has less access to that resource -- coordinated sharing can effectively organize access. In other words, an economic system that follows an egalitarian sharing model (like in a family unit) is less likely to establish an environment wherein one individual's access to a resource restricts another individual's access to the same resource; they recognize the danger in establishing a pie of their resources and fighting over them wherein one entity's gain is another entity's loss. The finite sum of the pie represents a zero-sum position in competition. It is important for a community that values efficiency to understand that a zero-sum perspective hinders the emergence of a higher state of efficiency, that of a cooperative and synergistically fulfilling organization.

Herein, a basic distinction is made between "zero-sum" games and "non-zero-sum" (or, "positive sum") games. In zero-sum games such as competitive wrestling, the fortunes of the players are inversely related. One win minus one loss equals zero. In non-zero-sum games, one player's gain does not negate the possibility of another player's gain -- it represents the potential for cooperation wherein the gains can be additive, synergistic. We call this 'cooperation' or 'symbiosis', and 'mutuality' when the interests overlap entirely. In a positive sum game, when life becomes better for any of us, then life becomes better for all of us.

Nation states are currently playing a zero-sum game with the Earth, our common heritage, and it is obvious that they are bruising the prize for which they compete. An objective look at what is happening on the Earth today makes it clear that we need to cooperate to preserve the habitability of the Earth for our strategic survival and for all its many living species.

There is always the possibility for developing an awareness that sees the Earth as a single organism and recognizes that an organism at war or competition with itself is doomed. We are here on this planet together. Though mankind lives on a big spaceship we call Earth, the more our population grows and the more our technological capabilities impact our environmental conditions, the smaller the Earth effectively becomes

-- and if viewed as a zero-sum game, the pie that entities compete over becomes effectively smaller, and hence, competition is likely to become more fierce. In a situation of limited resources, allowing the whims or personal vested interests of anyone to determine resource allocation would not only be dangerous, it would be suicidal. And, the danger of anyone owning those resources exclusive to themselves with the profit motive as an incentivizing factor should by now be obvious. The establishment and perpetuation of such a power structure will be everyone's downfall. If "you" were on a spaceship would "you" let anyone own all of its oxygen, or establish a system where ownership of any of the oxygen was possible, or even desirable? The oxygen would logically be considered the commons of everyone on-board, for it is part the interconnected system that maintains the life of those aboard. How about water? Ownership incentivizes monopolization [in part] by reinforcing the fear of not (or never) having enough.

If great care is not taken in the use of limited resources, then nobody will have access to them as differential advantage degrades a community's responsibility toward resource regeneration and a "tragedy of the commons" exacerbates conditions of scarcity. Answers about the commons lie in that which is common; they lie in the persistence of a "common sense" relationship among one another in a community and the community's relationship with the commonly regenerative ecological system that maintain its existence.

Optimized systems rely on organized and shared access to resources. Technology and automation are useful, but they are just the current "best" suggestion for accomplishing an engineered purpose; they are a means to an end. If (for some initially anonymous reason) the technology fails, a community will still need mechanisms for accessing those resources. Equitable strategic access to needed resources is the objective purpose, not that which is used to accomplish that task.

> **INSIGHT:** *There is no such thing as "competition on the honor system", particularly when individuals are fighting for their lives in a socio-economic system that pits individual against individual.*

3.11 Trust and access

> **NOTE:** *Potentially, concealment is a form of aggression when it denies the informed construction of a systems-level economic decision space.*

Resources and actions must be verifiable; where there is contribution, there has to be a way to ensure and verify that people are doing what they are supposed to be doing, and verifying what they are actually doing. Trust, and verify. In community, transparency is a form of global oversight. Where is the "social dilemma" when a community's life support needs are met and the remaining resources are equitably, efficiently, and sustainably put toward everyone's personal and social development, toward recreational wants, and toward the emergent restructuring of systematic resilience for a higher potential of common fulfillment? The "social dilemma" rests in our intelligence to design structural resilience into our fulfillment systems so that they persistently orient in the direction of our intended purpose.

In order to maintain a common decisioning system the community does not encode the divisionary and exclusionary concepts of property, ownership and [market] price. Instead, the Community finds any form of ownership of common heritage immoral [and likely to generate an artificial state of scarcity and competition among the community]. Our common heritage is the vested interest of everyone, particularly future generations, and cannot be owned by anyone. It must be accessed "equally". In the negative, it could be said that it is "collectively unowned".

In order for every user to have 100% trust in a system, the system must exist in a state of transparency for every user. **Transparency** refers to everyone knowing what everyone else knows about the system and changes made to it. Herein, the economic system exists to respond to its users, and thus, it is important to point out that transparency of the system actually refers to the system itself and may or may not be a characteristic of the functions the system performs on behalf of individual users. In other words, the operation of the system is transparent, but you have the ability to maintain the confidentiality of your personal information by encryption, for example. The system upon which your encrypted data is built is transparent, not your encrypted data. This is privacy-by open and peer design.

The economic model must draw from a "collectively" developed repository of data. The model must not be bureaucratic in that its complexities become circular, difficult to understand and have an appearance of arbitrariness. The model must also not be too simple in that it ceases to reflect reality, is incapable of meeting social and recreational needs, or cannot be measured against the outcomes of a value system.

Humans are the beneficiaries and users of these systems, goods and services; they are not the systems themselves. In other words, humans do not derive their meaning in life from their systems; they find meaning elsewhere -- and that sense of "self-initiation" and "self-empowerment" further reinforces trust in the system. The economic system is a conceptual and physical scaffolding for humans to use as they apply resources toward their needs in pursuit of their ultimate purpose.

> **INSIGHT:** *Always remember death as the passage from this physical world, which is inevitable for you. The idea of possessing anything is an illusion. Nothing in this physical reality can be owned. We arrive in and depart from this life with nothing but our consciousness. For the first time you may clearly see that the entire concept of ownership, and hence property,*

is a grand fantasy. How much of your life have you wasted on the lifeless objects around you. The possessions you work so hard to obtain eventually become meaningless and fade from view before eventually fading to dust. In truth, what is living if living is the collection of non-living objects.

3.12 Collectivist access

"Collectivist access-based" models exist in stark contrast to the design of the access-based model described herein. In highly authoritarian collectivist societies individuals sacrifice themselves to the collective [human] management of society by a ruling authority. Some claimed "access-based" models solely involve the governing of and management of human behavior. George Orwell's novel "1984" is an excellent example of such a society. Individual access is managed by the collective authority of "the Party" governmental identity collective centered around "Big Brother".

The smallest minority in a collectivist world is the individual. Yet, when equal access exists (i.e., distributive justice), then differential advantage and its behavioral and psychological consequences need not exist. A socio-economic organization that forces individuals to slave themselves out to pay for the necessities of life is not an intelligent organization for structuring society. Resilience does not come from the enslaving of oneself to another to feed oneself. Are we slaving ourselves and our time to pay for our things at undesired expense?

The business of profit is "their" business. The fulfillment of needs is our [social] community's concern. What is the real relationship between business and individuals because their certainly is one, one of profit. Yet, in truth, we are not each other's competitors (i.e., enemies). For it saddens me to see how much we distrust our neighbours and yet we easily trust commercial brands and suited figures. Community regeneratively creates healthy bonds, not "trusted brands"; in community there is no such attachment (i.e., no attachment to commerce, business entities, and commercialized public relations (or "brands")).

When a community's total information system is available to everyone then there is unlikely to be "grandstanding" - for what "you" know, I can know too.

INSIGHT: *The cycle of our fulfillment must go back to the land, and it is broken by the idea that there can exist the ownership of land. Further, the ownership of invention (e.g., patents) and of discovery (e.g., eponym) turns individuals into little demi-gods. And the moment they try to enclose or control it they defile the source that they accessed it through (or., "gave it to them"). People who are tyrannical with their own identity tend to be tyrannical with others.*

3.13 Access class separation

A.k.a., Class division, trade division, socio-economic class separation, etc.

There is real-world data identifying the separation in what any two people in society can access. This separation of access (into classes/categories of potential access) is most commonly known as the socio-economic class division of a society.

Different types of society identify class divisions in different ways:

1. In the market-State there are three dimensions to class division:
   A. Division 1 = commerce:
      1. Employer.
      2. Employee.
      3. Consumer.
   B. Division 2 = authority:
      1. Politicians.
      2. Administration and enforcement.
      3. Citizens (public).
   C. Division 3 = purchasing power.
      1. Homeless (dwellingless).
      2. Lower purchasing status class (poor).
      3. Middle purchasing status class (middle).
      4. Upper middle purchasing status class (upper).
      5. Richest and highest purchasing status class (elite).
2. In community there one fundamental class division (A) with a second possibly (B) dimension to class division:
   A. Division 1 = access:
      1. InterSystem Team (contribution access).
      2. Common user access.
      3. Personal user access
   B. Division 2 = Contribution ("honored"):
      1. Leisure access (once contribution is complete).
      2. Continued contribution.
      3. Coordinator contribution (with additional responsibilities).

In community, it is possible that 'life phase' may separate access classes, such that in the leisure phase of life their is either: the same as all other life phases or there is more leisure access available. It is possible to imagine leisure habitats (a.k.a., leisure cities) for those in the leisure phase of their life, as something not accessible to those in the education and contribution phase of life.

It is possible that in a community configuration of society there may be an "honored" class of access related to contribution, as those who have contributed, continue to contribute, and/or have added contribution accountabilities. This "honored" class may have, for example, the choice of a larger furnished dwelling (as the only separation in access). Those who are "honored" with this greater ability to access over others may be either:

1. Those who have completed the contribution phase of life get leisure access, which includes slightly more access than the other two phases; and/or
2. Those who have completed the contribution phase and continue to contribute get the choice of access to a larger dwelling (only), if preferred.
3. Coordinators with the greatest responsibility sets get the choice of access to a larger dwelling, and with that access they must host team building events (at the dwelling) at some regular interval.
   In the case of the last two, the additional access is only available while contributing. Once contribution stops, the additional access is not available.

> **NOTES:** *In the case of #3, the additional access comes with the requirement to host team-building events at their home, which is an additional layer of contribution that involves their personal access dwelling. In the case of #2 and #3, the ongoing service to community is honored with a small amount of additional access. In the case of #1, the former service to community is honored by access to leisure phase life services. Of course, there may also be a structure where there is no separation of access in this way.*

This secondary division of access (by life phase and/or contribution type) may not exist at all. And yet, even with this secondary class division, what is available to all, eventually, is reasonably equal. Those who have a larger furnished dwelling only have a larger furnished dwelling; they don't have more or less access to the remainder of services in their local habitat. All those who have finished contribution get access to all community services, which now includes leisure-full services (e.g., a leisure habitat).

3.14 Access service interactions

A sense of family and intimacy arises among those who share things. When people live with their families, do they bring weapons to the table to fend off fellow family members? Do they pay armed guards to protect their possessions in their bedroom, just in case someone leaves the table early and tries to steal the other's possessions? No, healthy families and communities do not do these things. If humanity viewed all other people as family members, then, in all likelihood, no one would need to be well armed to fend off anyone else. Everything would be shared. And that's what this is about; sharing, not hoarding as we do now in a monetary-based system.

In a family it's instinctive to look out for one another and be concerned with the needs of each other. In a healthy familial situation, you don't need to be told to trust your own "flesh and blood", as it were. How large is your family?

An access-based orientation is most easily recognizable by looking at the serviceable [access] interactions between members of a family living within a single cooperative home. Within such an environment there exist 3 primary forms of access. **Systems access** (a.k.a., InterSystem Team Access, contribution access) refers to those [infrastructural] systems that maintain the biological and technological continuation of the family, including but not limited to energy production and distribution, water recycling and purification, waste disposal, food production (i.e., a garden), material architecture and environmental exposure protection, and a wide-variety of other systems that maintain the basic structural operation of the family-home system. **Commons access** (a.k.a., community access) includes object-resources and services that are accessible to everyone such as televisions, furniture, cookware, books, common sporting equipment, utility items, etc. Family- and 'systems access' items are shared between the members of the family. And, there exist *personal items* (**personal access**) including bedrooms (or the family home in the case of the family itself), hygiene products, and other personal objects / personal equipment (e.g., personal computing devices). These three forms of access are possible between members of a small family or among individuals in a vast community. The belief that everyone needs to personally own one of everything is a tragically unsustainable and relatively new idea perpetrated by market[ing] entities seeking to capitalize on human fears of insufficiency [in access to their economic needs] for profit.

> **NOTE:** *When the idea of [self-]sufficiency is introduced into the conceptual equation, then there cannot just exist sufficiency for one (i.e., one individual or one group); for sufficiency to exist in a society there must exist sufficiency [in access] for all.*

3.15 Logistical resource access

Under this access-based model, the conceptual space that the term 'resource' holds is further characterized by the terms **coordination, allocation**, and **occupation**. These terms are most easily understood by looking at organisms in an ecosystem: within an ecosystem organisms coordinate the allocation of resources and their systems occupy them. In logistical terminology this characterization is often known as "coordinated resource allocation and usage (or occupation)". Herein, "occupied" resources are "in use". "Allocation" simply refers to the "re-location" of a resource

As a tool, the process of "logistics" solves for the optimization of coordination and the most efficient utilization of resources. All [enterprise] logistical systems maintain a global resource inventory. Through "logistical operations", resources are allocated out in a coordinated manner to services that have been designed by individuals in the community.

Herein, the resources which have become integrated into goods and services are still common heritage, even though they are in use and otherwise "occupied" by systems and computationally designated by a design protocol.

Herein, it is important to state two things: First, that the Community also maintains an environment where 'personal access' is respected; yet, resource allocation and occupation is still seen as temporal by individuals accessing resources on a personal basis. And second, there is a difference between a system that is set in and designed to transcend a fascist world and a system that prescribes a fascist world.

A more materially equal society is a more fulfilled society. Research by The Equality Trust (*External Research*, 2020). We have the potential to optimize the coordination of our fulfillment so that we all become equally fulfilled, and we can do this [in part] through cooperative design.

> **NOTE:** *An access-based system requires coordination, and coordination necessitates planning -- logistics involves planning. Planning is necessary for sustainable resource availability, and hence, strategic access -- strategic design facilitates strategic access.*

3.15.1 Service inventories and catalogues

One of the most common forms of service access in community is an 'inventory'. An 'inventory' is a detailed list of every item potentially accessible in a system. In any economy there are three primary types of inventory: a resource inventory (per every system); a service inventory (per localized system); and a goods inventory (per localized system). An inventory is essentially a set of accounted for and usefully categorized logistical data referencing [material] objects.

Herein, lists of goods and services available in the system are represented to the user through a digital video interface and a backend logistical, inventory catalogue. And, for every inventory there exist a single transparent "ledger" of all access - there exists transparency in access. A catalogue is just another name for a "library" of which there are both digital forms (e.g., a library of films on a video sharing platform) and physical forms (i.e., a physical book library and "checkout/return facilities").

And, there are "sharing centers" (also known as "check-out/check-in" centers) where individuals can checkout and then return items on a temporal basis. Most checkout centers are placed in a fixed spatially structured position in the city-community. There are even inventory catalogues and scheduling for physical spaces. In other words, there exist "room" spaces that can be "checked-out" for temporary use.

Space is generally designed so that it can be used for multiple purposes. Sometimes the efficient use of space is about making the space multifunctional. In other words, sometimes efficient use of space is [in part] about designing space so that when it is not in use for a specific function it can be used for another functional purpose.

Herein, sustainable living refers [in part] to living with the minimal amount of space to provide the maximum amount of access to your needs, wants and preferences. This is done through design.

Land space usage is designed in parallel through the decisioning system. In an integrated self-sustaining, abundance generating city system there must be great consideration given to land [design] usage and access. Each integrated city system in the community has a finite amount of land dedicated to its system before nature is returned to until a new networked city is located.

In community, the problem isn't the amount of physical space needed for a set of integrated city systems, the problem is the intelligent and strategically planned organization and design of the city / set of cities, and self-education, of course.

> **QUESTION & RESPONSE:**
> *Why would I return the book if there wasn't a fine (i.e., a punishment)? Because I want others to be able to read it as well, of course. It's called 'social conscience'. Where there is social conscience there is also to be found a structure facilitates it, and a critically accepted value orientation initiates toward that behavior. There are people on this planet who have not been mentally conditioned into the 'reward/punishment' mentality – who still hold on to their intrinsically oriented selves, or who have de-conditioned themselves and found their intrinsic self, once again. We can all re-orient whenever we choose. We can restore ourselves to a state of common fulfillment. Those in community think about what is good for a community and they can see how their actions affect the whole.*

3.15.2 Time and service integration

Early 21st century society has been liberated from the drudgery of "wash work" to go stock the shelves at the big box store that must be driven to. Though our understanding of ourselves advances, the integration of our technical service infrastructure has advanced little. Are washing machines and other technologically consumable products really labor saving devices -- are these products designed, delivered, and acquired as "consumables", or are they part of a larger, integrated and freely accessible technological service infrastructure?

In early 21st century society, governments and industry are trying to force and pressure the technical integration of electronic systems. And therein arise the problems of privacy invasion, surveillance, and ultimately tyranny. It is important to recognize that one is committing the fallacy of equivalence when they premise their discussion of or argument against an access society on the socio-economic architecture and material infrastructure of a different, notably property-based system. The resulting architectural design of a access-resource founded system is an integrated habitat-city living environment; it is a different environment entirely, both conceptually and materially [to modern day cities, suburbs, or the lifestyle in general]. Principally, it requires thinking about the planning of cities (i.e., "city planning") from an entirely different perspective - both one's own perspective as well as the perspective of everyone desiring access.

3.16 Coordinated access to change logs through a digital ledger

A.k.a., Ledgers (tables, data and scripts) in a cryptographic trust chain, on-chain ledgers, digital ledgers.

The concept of a digital ledger allows for a communications infrastructure that is coordinated and operated cooperatively by the informed agreement of the whole of a globally networked community. The innovation of Bitcoin is not the peer-to-peer technology itself; it is the fact that the underlying protocol solves for the problem of transparent, auditable, irreversible, cryptographically signed [message] transaction accountability (or, in the case of community, event tracking). At a basic and fundamental level digital ledgers (e.g., Bitcoin and others) are a permanent and transparent journal/record, a distributed 'ledger'.

Using decentralized ledgers and on-chain representation to record data: Decentralized ledgers and on-chain representation offer a new way of recording and managing data related to society. By using distributed ledger technology, data related to all aspects of society can be stored in a decentralized and tamper-proof way, allowing for greater transparency and accountability in the coordination of common heritage resources. Decentralized ledgers can also facilitate the tracking of products in the habitat. This technology enables everyone to trace the origin of societal products, verifying that they come from and stay within community sources.

Broadly speaking, cryptographic distributed ledger technology involves a mathematically sound and secure way for networked agents (and "nodes") to agree on something. The protocol behind distributed ledgers is not [just] a currency -- the block chain concept extends further than that of currency to just recorded data accountability. Currency (tokens) just happens to be one of the implementations that organically emerged from the protocol's design under a global market-based economic system. Note that in its present incarnation, digital ledger technology provides both a global currency and a distributed accountable list of events. And, the same technology that makes Bitcion essentially fraud proof could be applied to community decisioning (or "governance", if someone wishes to call it that). Simply, a distributed ledger is distributed cryptographically secure ledger of information. The system enables resilience of an information network such that if one computer tries to corrupt it, then the remainder network can recover and/or remain secure, open and distributed; it is a way of creating and preserving accurate information in digital form.

A "blockchain" is a transparently shared public ledger (database) of all information transactions that have ever been executed on the network and based on a set protocol. It is constantly growing as "completed" blocks are added to it with a new set of recordings. The blocks are added to the blockchain in a linear, chronological order. Each node (computer connected to the network using a client that performs the task of validating and relaying transactions) gets a copy of the blockchain, which gets downloaded automatically upon joining the network. The blockchain has complete information about the addresses and the content those addresses hold from the genesis block to the most recently completed block.

The most significant real world problem that Bitcoin solves (or, purports to solve) is known by several names including: the Byzantine general's problem; the Byzantine fault tolerance problem; the decentralized consensus problem; and, the timestamping problem (actually, Bitcoin solves for multiple problems). It solves [sufficiently] for this problem with the idea of the "blockchain" (i.e., the iterative creation of a verifiable global ledger produced through 'network consensus'). The algorithm that creates the blockchain is the first purported [digital] solution to this problem.

The Bitcoin ledger sheet is an example of an integrated-distributed protocol for facilitating socio-economic access sharing, and it is an example of a process that such a system might run. The Bitcoin ledger is an identification of every transaction [in 'block chain'] that has ever taken place on the Bitcoin network throughout the history of its existence. It is transferred in full to every node of the network. Bitcoin itself is an example of a distributed network and the design of its protocols maintains its integration (and integrity) ... given what is known. It operates as a distributed model for trust.

The Byzantine general problem is a thought experiment meant to illustrate the pitfalls and design challenges of attempting to coordinate an action by communicating over an unreliable link.

The Byzantine general's problem presents a scenario with two armies. The two armies, each led by a general [of equal rank], are preparing to attack a fortified city. The armies are encamped near the city, each on its own hill. A valley separates the two hills, and the only way for the two generals to communicate is by sending messengers through the valley. Unfortunately, the valley is occupied by the city's defenders and there's a chance that any given messenger sent through the valley will be captured. While the two generals have agreed that they will attack, they haven't agreed upon a time for attack. It is required that the two generals have their armies attack the city at the same time in order to succeed, else the lone attacker army will die trying. They must thus communicate with each other to decide on a time to attack and to agree to attack at that time, and each general must know that the other general knows that they have agreed to the attack plan. Because acknowledgement of message receipt can be lost as easily as the original message, a potentially infinite series of messages are required to come to consensus. The thought experiment involves considering how they might go about coming to agreement.

The blockchain is a process that solves for the verification of a decisive agreement [to attack] at the same time. In other words, it creates a scalable mutuality-based decision network. Bitcoin is essentially a decentralized and distributed consensus system that is backing up a state transition system (as "*go" [for attack] /* "*no go" [for attack]*) -- the consensus system tells everyone in the network: 1) what transactions happened; 2) in what order; and 3) the state transition system will tell you if a [trans]action is valid. In other words, the events of all tasks are digitally recorded chronologically, their validity is checked, and the record can't be feasibly changed. Said in another way, the blockchain is a verifiable history of when events happen and whether those events are valid based upon a transparent and commonly agreed on protocol. Herein, there is no concept of an internal state. A transaction is either complete or it is not complete, available or unavailable. The architecture doesn't allow for a multi-state action. Now, just imagine the potential for fulfillment if there could exist a history of all economic events [in the community] and their validity toward mutually fulfilling access.

Bitcoin, is intended to give Byzantine fault tolerance. Fault tolerance - If you have 1/3rd or fewer faulty nodes then you can have linearness (or "correctness").

The protocol achieves this capability [in part] by hashing every block wherein each block contains a hash of the previous block. When a block hash is broadcast, nodes are capable of recognizing it as the [in-]correct one through their own validation ability. Therein, confirmed transaction use a canonical timestamp (agreed by the blockchain); whereas, unconfirmed transaction have an estimate, but similarly unconfirmed timestamp. Also, nodes are identified by an address so that they can be authenticated and we know who the message came from. Note that any message on the network is a 'transaction'.

At the present time the Bitcoin network is based on a "proof-of-work" principle that is captured in a distributed database known as a "blockchain". The concept of "proof-of-work" is what makes Bitcoin unique, technologically speaking, for its time. The blockchain enables a network of distributed nodes to achieve agreement (or "consensus at scale") on the common state of the network (Read: on a common information model).

Presently, each node in the Bitcoin network proves (or more accurately, "shows likelihood") that it has participated in resolving the distributed [network] blockchain through a system called "proof-of-work" which involves thermodynamic effort. Proof-of-work is like solving a very difficult problem and then proving that you have solved it. It is very easy to verify and much harder to solve. In the community, however, tamper-evident logs [of connected peers] are part of the substitution for the original Bitcoin protocol involving the thermodynamic mechanism known as "proof-of-work". In community, there is no coin ownership, and hence, no necessity to mine and validate coin ownership. The block[chain] can be created with no significant effort, versus the Satoshi Nakamora (2008) whitepaper approach which uses thermodynamic mining. The thermodynamic effort of mining bitcoins is fundamentally an unsustainable activity. A tamper evident log provides a way to ensure the nodes [in the community network] are aligned with one another. Such logs can be created through 'timeline entanglement'. (Maniatis, 2002) There are means of powering the distributed consensus engine known as the blockchain that are internal to the network and do not require significant outside resources (e.g., thermodynamic effort), particularly when mining is abolished entirely; in community, there is no incentive for winning and there is only commonly desired fulfillment.

A tamper evident log [of connected peers] is a permanent record and no one can go back and change it. It is "penned only". It is recorded. Essentially, peers verify that each is doing things right by the protocol. Every peer runs the same code base. The tamper-evident logs contain the name of each operation the peer performed as well as the inputs and outputs of that operation. Thus, any peer can remotely attest the correctness of another peer by replaying its log. Each entry on the log is a description of some [trans]action - a state that an agent has which gets logged; then the inputs that the agent received that causes the action gets logged; the operation name then gets logged; and then the actions that resulted from the operation get logged too.

It is important to recognize that Bitcoin is open source; anyone can examine the code and it is constantly being audited by what is known as 'network consensus'. The entire Bitcoin network achieves this 'consensus' on the state of the network and transactions in the network every ten minutes. There is a common decisioning protocol in the network, and there is a refresh "heartbeat" to the network. This means that Bitcoin relies on network consensus rather than central authorities for verifying itself and transactions (and in its own case, minting new currency). Regulation/control is built right into the technology itself.

Note, the blockchain itself can't be changed without everyone in the network deciding to change it; and that, is true community consensus.

The public ledger itself is completely transparent. There is no "shadow" element to it. Hence, Bitcoin is not anonymous, it is pseudonymous. It is possible to send and receive messages (e.g., bitcoins) without giving any personally identifying information. However, achieving reasonable anonymity with Bitcoin can be quite complicated and perfect anonymity may be impossible. The pseudonymous nature of Bitcoin means that sending and receiving bitcoins is like writing under a pseudonym. If an author's pseudonym is ever linked to their identity, everything they ever wrote under that pseudonym will now be linked to them. In Bitcoin, your pseudonym is the address to which you receive bitcoin. Every transaction involving that address is stored forever in the blockchain. If your address is ever linked to your identity, every transaction will be linked to you. This functional element of Bitcoin means that cryptographic[ally secure] accountability becomes possible.

The blockchain is a middleman neutralizer (i.e., it renders the "middleman" obsolete). Structurally, it is person-independent by design.

Having one ledger (inventory of events or log) is fundamental to the system herein (and also, to every digital currency in existence). It would be a disaster to have several blockchains (of transactions or and multiple models of the operation of the community). Yet, this doesn't mean the community's [socio-economic] network is controlled by a centralized force. No one "owns" or "centralizes" these [open source] protocols. No one owns HTML, for instance.

Cryptocurrencies are currencies whose operation depend upon cryptographic primitives and a common understanding of how the software [technology] works. This facilitates trust in the technology and in the network.

Nearly every kind of application that benefits from the ability to tell when a certain message was sent is improved through the blockchain technology. It is a protocol that becomes a platform on top of which any feature [toward cooperation (cooperative access)] can be built. In community, it is here that we build-in our values (into service applications and operational processes/ protocols) within the [economic] decisioning system. Such technology allows us to create a cryptographically equitable distribution and service application system. Herein, we can feature an economic system designed for distributed access and for our mutual fulfillment. It is a medium in which we may freely create applications and tools that extend our potential [information technology] capacities in mutually fulfilling ways.

In a community-type society, cooperation is substituted for adversity when deciding the correct chain for the nodes to support.

Herein, our information [trans]actions can be timestamped forever. Even digital documents can be put onto the blockchain, where they are timestamped and remain. Someone can add their effort to the blockchain so that it is timestamped and accounted for, forever. It is this concept, not Bitcoin, that makes cooperative decisioning possible at scale in a technically digital community. The protocol effectively creates a distributed timestamping system [as a technology] that can be used for a lot more than just currency. It can be used for modeling the distribution of resource allocation and occupation; it can be used for effortful coordination; and it can be used as an accountability structure.

The following are several uses of the blockchain technology:

1. Logistical coordination and resource allocation.
2. When someone becomes a part of a decentralized interdisciplinary systems team, then there are a set of technical rules and activity tasks associated with the selected role and the resources available to that individual. Individuals with a set of resources mediated by a set of rules = an [systems team] organization. And herein, these technical rules are "enforced" by accountability on the block chain.
3. Decentralized threshold triggering through [trans] action validation.
4. First to file systems such as a reputation system to build team registration and registration in general. Bitcoin as an application can be described as a cryptographic first-to-file system (i.e., the order of transactions are critical).

3.16.1 Blockchain and the global information access network transfer protocol

Behind the globally coordinated access system is a "blockchain", which becomes a protocol that everyone can use to virtually redesign the community in parallel (i.e., 'distributed integration', which is a strategy that the Bitcoin protocol follows). Logistics has now been solved for all resources and tasks in the community [network] without referring to a central authority. The Bitcoin protocol (Nakamora, 2008) solves for this in the form of a [digital currency and] distributed ledger, which enables a distributed network of computers to agree on a state of reality - a list of accepted [trans]actions. All [trans]actions in the network can be verified by the network instead of a central authority (i.e., every node self-integrates).

[Among self-integrating (and self-sufficient) nodes in network] there is trust in the structure of the system without having to absolutely trust one another and without having to trust some central authority. It equalizes trust at a fundamental, technological level. Hence, no gate keepers to the exchange of money in the case of Bitcoin, and access/resources in the case of an economy based on real-world resources.

Bitcoin is a decentralized consensus platform, a neutral and lateral network. Within the network there is no central control by an authority. Decentralized networks have the potential of being highly equitable and are significantly different than the centralized systems ubiquitous in early 21st century society. At a technical level, distributed networks are more "robust" because there is no single point of failure; which also means that there is no central "authority". Due to its design there is a slim to none chance of corruption or errors. Of course, to those who seek authoritarian control and consolidation of power and monopolization it is a "weak" system for it cannot be controlled and directed by an authority. Its mathematical design makes it nearly impossible for a central authority or institution to take over the system. It doesn't require trust from any of the individual parties involved in the network as the [trans]actions are verified by the combined computational power of the network. In other words, the trust is in the system and not in any one individual or group of individuals. Further, an agent can't actually cheat (or, it is nearly impossible to cheat) the system because the system makes such behavior explicit in real time.

Importantly, currency is only one utilization of this type of prototypical strategic solution. Other states of reality can be agreed upon too, such as "who" has the best design for a given functional object as well as which inventory location (i.e., "who") has said quantity and quality of a given natural material. In other words, this type of protocol doesn't just solve the problem of currency, it solves the problem of anything that requires trust (Antonopoulos, 2014). We can now, technically, do without a centralized organization (and when there is the necessity or desire for some form of centrality, now we can maintain absolute accountability and build the centrality transparently).

The integration of this type of strategic protocol enables problem solving at scale in a massively distributed social environment; it enables the solving of problems that could previously not be solved; it technically enables the trusted verification of information [in an information system]. The Internet is the first major example of massive distribution in our lifetime, and it is part of the "first wave" of a sweeping change. The internet allowed us to take distributed control over information, communication, truth, fact and opinion, and completely decentralize those functions, by creating a medium by which individuals might [more thought responsively] exchange information without having to rely on a central party. In the coming second wave we will see the decentralization of control over material objects. The very idea of employment in a market will "de-materialize" when we can recreate digital material reality in material form in an efficient localized manner. This might sound, "far out there", but we are only talking about such things as 3D printing, extruding, lasers, and robotics [of which there are both primary and maintenance systems]. Exponential reality integration moves us exponentially more quickly toward a highly thought responsive environment. Wherein, we must ask ourselves, in what way are we orienting our thought structures toward a higher state of fulfillment; for when they are manifested more rapidly and we have a greater creative ability, then thought structures that create suffering will create "that" a lot faster.

This 'global access protocol' is essentially a designed transport-network calculation based upon a variable number of micro-calculation factors. It is a "block chained" protocol that contains categorized information about resources in the [global resource management] network.

It also means that a centralized authority no longer has to be the origin and definition of truth at a technical level and on a cultural basis. The Internet allowed individuals to derive their own "truth" without reference to authority. Once you create a system that allows for decentralized organization that system will inherently scale better. And, it will deliver more value to each of the participants in that network than any centralized system can. Over time, it will start generating what is called a "network effect" where, as more participants join the network, it multiplies the value of the network rapidly and virally. Each new participant makes the network more valuable. Centralized systems have a difficult time scaling at a rapid rate (i.e., "fast"). The economic theme for the last 25 years has been decentralization, and now money, which is just information, is becoming decentralized.

There is no need for a State, and possibly, there never was. There is no need for the financial market, and possibly, there never was. To put it lightly, we just haven't been designing our increasingly technological environments with structures that scale with efficiency. More truthfully, early 21st century society has been re-structuring itself with millennium old beliefs. We can now see this technologically.

Bitcoin and the technology underneath it (i.e., the blockchain) creates a global network that allows you to transmit an information resource as well as decision-oriented information from endpoint-to-endpoint, from "A" to "B", without any intermediaries within a trusted structure. In market lingo it is a "peer-to-peer value network" where "value" can be transmitted between endpoints without an intermediary. If you use it to transmit bitcoin, then it enables a currency. You could also transmit stocks, bonds, share certificates, tokens, or inventory items; you could use it to verify resources; to verify accountable work activity; to allocate resources; to verify modifications to a design or feedback records in a habitat; to facilitate the arrival at a go/no go transport decision through decentralized threshold triggering; and you could use it to share the most up-to-date optimized design specifications for our intentionally modified environment, our emerging material habitat. It essentially removes "personhood" from the system (i.e., it is a initial version of a "person-independent" decentralized transaction-transtask system) -- and those transactions can be anything we want them to be.

Today, the internet is both a platform for content and for computation. A person-independent transaction protocol can transfer content on top of the internet and behave in the interests of the community users using it, which may be other autonomous systems or us as individuals. In community, the technology is used as a system for processing decisions, such as how to allocate resources, in a completely autonomous manner. It is the foundation of a system that cannot be corrupted, co-opted, or subverted to serve "the interests in charge"; because, there is no one in charge, it operates by a logically referential mathematical algorithm. An algorithm is a formulaic structure of mapped relationships (i.e., it requires the use of math, which may be visualized into structure).

This protocol is basically a consensual and openly designed algorithm for producing that which we agree and "trust" is the optimal next iteration of something (e.g., the real world information model and the habitat systems of our community). With this tool we can share the designs of our socially optimal solutions (or SOS).

The global access system uses a trusted coordination protocol to maintain technical neutrality in the Community's information space. Within this technical space anyone can transmit from address A to address B, and the system doesn't care who accesses either address, what content was passed, what geographic location the transaction occurred in, or even how much "value" was in the transaction. Herein, we recognize that a protocol may be traced to its origination as a strategy. A strategy becomes a design protocol, which is encoded as a transport protocol in a network, and the type of protocol we see with Bitcoin structures trust into the system for our mutual fulfillment making the system immune to politics. A design requirement of the original strategy is the technical encoding of an access system for resource transactions.

Transparency is structurally incentivized by the basic network transfer protocol (i.e., the economic system) for the community's information space. And herein, we can audit each other for accountability. Wherein, 'openness' makes compatibility more likely among community. Community shares the "wealth", it is a population of self-directed individuals "investing" in everyone's future.

There are two kinds of validation tasks in Bitcoin: transaction validation and fork validation. These are closely related, since validating transactions is at least a subcomponent of fork validation.

3.16.2 Attacking the global information access platform

A hostile takeover of the computation of the economic decision network is highly unlikely, and if such an attack were followed through with it is unlikely that it would be effective. If it is done, then all of the incentives within the community are against it. If anything, such an attack would lead to more publicity and strengthening of the open algorithm. Keep in mind that through network consensus the blockchain can change -- the technology can change and be updated if the participants in the network agree. Like any technology it can become more resilient over time; the system's design will evolve responsively and dynamically to change and adapt to external stimuli. An attack strengthens the system (like the human immune system; your exposure to pathogens makes your body more able to resist those infections in the future). Similarly, attacks against the network force the network to adapt, which then makes it resilient to those attacks.

If someone tried to maliciously alter the community's information model, then they would achieve two things. First, they would violate the trust of the network by doing this; wherein, they would be seen as an agent seeking to concentrate power in their hands or for some other reason inhibit need fulfillment in the community. So, it is not in anyone's interest to do it because they wouldn't get the reward of the aim, which is the power (in the case of Bitcoin it is tokens on a network which lose value exponentially if they become too centralized). Among community, when we see a centralization of power in one unit (i.e., significant non-reconciliance), then we are likely to move toward (i.e., redesign toward)

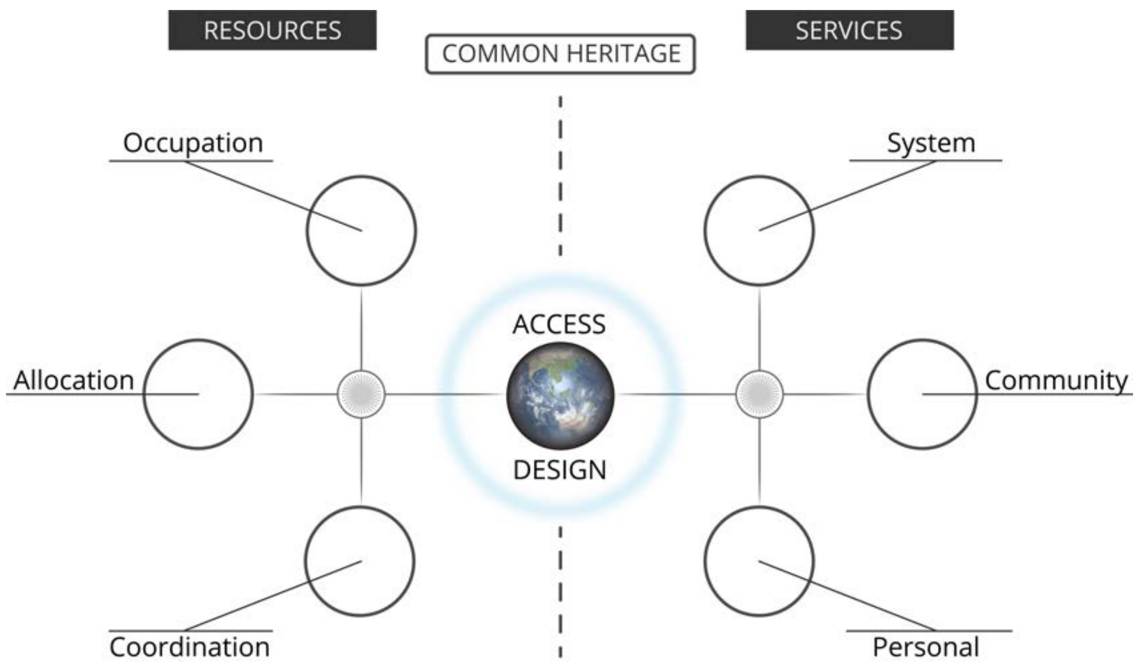

Figure 16. *Access to resources and services through the re-organizational design of common heritage.*

de-centralization of that unit [of power]. This is why the system must be open; it must be open so that a movement toward decentralization is always a potential. Among community, when power begins to concentrate, then individuals are prone (i.e., incentivized) to disperse and decentralize it [when they aren't inhibited from doing so]. In the worst case, if someone where trying to do this, they would get blocked (or "excluded") from the open modification of the network because it would be in the best interests of everyone else to keep them off the network. Fundamentally, to accomplish a successful attack someone would have to do it without anyone noticing, which is very difficult when all transactional changes are open and everyone can see them, and the protocol itself is open.

3.17 Identifiable information access

> *A.k.a., Access to information about an individual and their activities, identity security.*

Privacy and anonymity are similar in that they both concern personal control over personally associable information such that there is an intentional reduction in others identification and observation of the relationship of association. Both concepts convey the existence of a restriction of access (or "intrusion") to an informed relationship of association. Anonymity and privacy are complex societal processes that take on different meanings under different societal configurations. The important distinction between the two concepts is that 'anonymity' relates to being non-identifiable, whereas 'privacy' deals with the ability to be selectively secluded:

1. **Anonymity:** Anonymity is derived from the Greek word ἀνωνυμία, anonymia, meaning "without a name" or "namelessness". The adjective for anonymity is "anonymous".In colloquial use, "anonymous" is used to describe situations where the acting person's identity (i.e., name) is unknown. The important idea here is that a person be non-identifiable, unreachable, or untrackable/ untraceable. Anonymity is seen as a technique, or a way of realizing, certain other values, such as privacy, or liberty.
   A. Anonymity refers to the state of not having a name or identifying information associated with an individual and/or their activities.
2. **Privacy:** Privacy (from Latin: privatus) is the ability of an individual or group to seclude themselves, or information about themselves, and thereby express themselves selectively. The adjective for privacy is "private". Privacy is security of personal information and/or behavior.
   A. Privacy refers to the state of being able to control who has access to your personal information and how that information is used.

Simply, privacy is a concept describing activities that you keep entirely to yourself, or to a limited group of people. For example, someone may create a space of privacy when closing curtains [as a technical measure] to "shut out" outside observation. In contrast, anonymity is when other people will see what you are doing, just not that it's you doing it. The writing of a message on an online discussion forum that cannot be traced back to your personal identity is an example of anonymity.

3.17.1 Anonymity and access

> **NOTE:** *Under conditions of prohibition, one must be careful and take precautions in what and how when they share.*

Fundamentally, anonymity on a social platform, or just the internet in general, allows for questioning and criticism without fear of retaliation. In community, it is important that we don't limit our options when it comes to communication and to sharing.

Anonymity may be said to have two general sides, a constructive and a destructive. The application of anonymity techniques may be used constructively to reveal truths about the operations of a society, the secret[ly unpleasant] circumstances of an organization or two or more conspiring individuals. Maybe someone needs to shield information from a corporation, State, or other organization doing harm. Hence, anonymity allows anyone to say unpopular and/or controversial things without fear of reprisal. In a competitive and/or authoritarian society anonymity gives at least the notion of protection for information disclosure and dissent. If one desires to use terms like "good" and "bad", then anonymity may be said to do more "good", than "bad.

There is, however, a salient issue with the spread of anonymous information – an anonymous communications channel can also be used to spread mis- and dis-information. The concealing of a source of information provides protection, but the question one must ask themselves when they encounter such information is, "Who is being protected?"

Anonymity can be applied to acquire greater influence as well as sow seeds of harm, which in a society based on socio-economic competition conveys various [commercial and political] advantages. When a society encodes the idea of socio-economic competition as well as anonymity, then there exists a powerful incentive for influencing others for one's own competitive advantage. Additionally, anonymity can be used destructively, and without fear of shame, to tear down the social psyche of someone who isn't internally self-sufficient, such as through bullying, or to a lesser degree, internet trolling.

In early 21st century society there are people who feel it is "negative" or "wrong" for everybody to be able to say and share whatever they want, anonymous or not, but that's especially true with a government or industrial organization that is doing things that every healthy human on the planet would take serious issue with. Hence, when persecution is a possibility, anonymity is a fundamental necessity. And, for there to exist an egalitarian fulfillment system, there must exist a structural allowance for anonymous criticism, communication, and information disclosure.

The following is a common statement among those in early 21st century society that have made themselves sufficiently harmless and non-threatening to those who wield power: "I am not doing anything wrong. Only bad people who do bad things want anonymity and privacy." This is a conclusion that we should have all kinds of reasons for avoiding. Firstly, what's "wrong" and what's "not wrong" is a shifting thing in a political society. Secondly, when the average person says "doing bad things" s/he probably means things like plotting attacks or engaging in violent criminality, which is a much narrower conception of what people who wield power mean when they say, "doing bad things". For people who wield power, "doing bad things", typically means doing something that poses meaningful challenges to the exercise of their own power. Hence, people in positions of privilege try to suggest that privacy and anonymity are things that only criminals who "do bad things" want, which is a misdirection and a lie.

Without an anonymous platform for people to openly express their opinions, no matter how "offensive" or hurtful, there will likely exist: (1) the opposite, as a platform inhibiting freedom of speech and expression; and (2) individuals in the community will not be able to effectively assess the community in the most open and active manner, because opinions that people would have otherwise expressed cannot be expressed. Hence, they become repressed and "bottled up", which may eventually lead to their outburst or flare-up in a highly grotesque and unfulfilling behaviors. It is true that open and anonymous platforms can be used to spread doubt and confusion, but they can also be used to discuss important matters when times have begun growing "dark" and authoritarian power has begun to consolidate. In the Community, such a platform may or may not be used; regardless, it is important to have such a platform for expression and communication.

Anonymity can be beneficial when it conceals an individual's identity, and when no one knows who "you" are, therein "you" are more likely to be as honest and as exploratory as you can possibly be. When "you" are trying to build or to develop or to understand something that amazes "you", but "you" do not want to worry about someone going, "oh, you're retarded", then anonymity can make exploration and play more comfortable. It may be said that it makes exploration easy on the ego and insploration easy on the mind. A persistent and consolidated identity has the potential to reduce our ability to express ourselves, and make mistakes. Hence, anonymity can be especially important in the world of massive online social networks, where if someone makes a serious error, it is there forever and no one will ever forget.

Regardless of the context in which anonymity is applied, it is wise for individuals to not just accept what is claimed – in early 21st century society, many people just accept whatever random thing is claimed by someone with whom they feel an association [without any attempt at verification]. Hence, anonymity can create: 1) a false sense of trust with someone who has an agenda, which cannot be verified; and, 2) it can re-enforce trust with someone who might believe their information, but also has not verified it, and is therefore spreading possibly false information, which cannot be verified. In either case, due to a lack of accountability and verifiability there ought to be no trust in the relationship. Yet, humans are principally a social organism and are naturally inclined to trust others with whom they see a similarity [and through what they may see as a neutral environment (Read: the internet)].

> **TECHNICAL NOTE:** *At the present, data packets are dropped onto the Internet and they move with equal priority to their intended destinations. Additional protocols (e.g., cryptographic) provide a measurable degree of trust. In community, individuals trust one another not only because of common association and social reputation, but because they understand the functioning of the systems in which they participate, from concept to hardware and software.*

In community, the choice of anonymity exists at the level of personal intercommunication, but it does not exist at the operational level of the system itself where transparency and accountability are structurally encoded. Herein, the platform by which decisions and modifications about the community's habitat are arrived at, and carried out, is designed to account for the identity and actions taken by individuals and systems (i.e., accountability and transparency by design). There is real power in anonymity to do harm, particularly at the socio-economic level. Hence, the structuring of freedom into a community comes [in part] from accountability at the systems level and the choice of anonymity at the personal level.

3.17.2 Privacy and access

> *"He who does not move does not notice his chains."*
> *- Rosa Luxemburg*

Privacy is a material or digital structural boundary that has been placed in space-time to reduce unintended observation. In this sense, privacy is cooperatively designed (i.e., privacy by design), and not given from authority (i.e., privacy as a right). Hence, it is incorrect to say that privacy gives an individual the "right" to deny access or intrusion by others. More accurately, privacy is the designed structuring of a social access limitation, and in this sense, it refers to an intentional reduction in access to, or intrusion in, a personal [information] space. In the early 21st century, privacy is about who has control of and/or access to information.

Privacy can create a space of openness for an individual to arrive at independent thoughts and decisions about one's life, family, home, lifestyle, relationships, behaviour, and communication. Privacy represents the creation of a space around us to expand into. Practically speaking, privacy represents a "safe", unobserved place for an individual to develop new ideas, to think and to reason, and also, to speak without immature criticism or discrimination (i.e., "intrusion"). Hence, equally essential to what it means to be a free and fulfilled human being is to have a place that we can go and be free of the judgmental eyes and speech of other people.

Having time and space alone to think could be crucial to our mental health since we likely evolved in such an environment. The evolutionary clues would tell us that our ancestors, through the course of their everyday lives, spent much time in nature, and one would assume, also alone in thought. It could be that we very much need that time and space, more than we suspect, to process our thoughts without external judgment and stimulation. In truth, natural processes need time and space to "unfold". Hence, privacy could possibly be considered a mental health issue.

> **NOTE:** *Some argue that there's nothing special about "privacy" and that the concept doesn't merit an independent existence. Karl Marx, for example, viewed privacy as a symptom of an atomized and selfish society, intent on protecting the material self-interest of the "haves" faced with a possible revolt of the "have-nots".*

The range of behavior options that we consider when we are being watched is severely reduced. This is a fact recognized in social science and scientific literature. When we think we may be being watched, the behaviors we engage in are vastly more conformist and compliant. Human shame is a powerful motivator, as is the desire to avoid it. Research finds that when people are being watched, they are less likely to take decisions that are the byproduct of their own agency, and are more likely to conform their behaviors to expectations that others have of them, or the mandates of societal orthodoxy.

It is important to note that a loss of privacy (or the non-existence of privacy) does not necessarily mean an increase in accountability. When there is an authority that claims to "give privacy", then there is often a loss of privacy by means of surveillance, and no gain in accountability on the part of authority.

In community, there is no expectation of privacy in these situations:

1. **During contribution:** While contributing as part of the InterSystem team.
    A. Exceptions:
        1. When a contributor is using the bathroom/ restroom.
        2. When activities include the defense and security of the community.
2. **In public (physically & administratively):** There is no expectation of privacy in public. There is no expectation of privacy when physically in public, and there is no expectation of privacy when one's identity is administered in public (e.g., when engaging the community residency and habitation program). There is no expectation of privacy when accessing services (and objects) from the habitat (which is a public act). There
    A. Exceptions:
        1. There are common access areas in habitats that may be reserved for private events (i.e., privacy event access).
        2. An individual's (or family's) home is their personal private access area (i.e., privacy access area).
        3. An individual's dwelling (residency) address may or may not be public.

The three primary questions in terms of privacy control are:

1. What information is collected and where is it collected from?
2. Who has the "right" to restrict access?
    A. Who has the "right" to access private information?
3. How is rectification (correct) of wrong information possible)?
4. Is erasure (deletion) possible, how is it erased, and who erases it?

Additional significant questions that relate to privacy include:

1. How do we design a system with accountability at the systems-community level and the choice of privacy (by intentional degree) at the personal level?
2. How do we design a system where privacy is built-in to individuals' personal [information] space by design, regardless of what information they maintain in that space?
3. How do we respect each other's needs and desires while still connecting freely?
4. Do we really want some authoritarian State agency looking at all the digital traffic in the world just to see if someone's "right" privacy was violated?
5. What if we were to see privacy as a socially and technologically organized consideration, not a legal one?

In the Community, there is structural accountability in the operation of and modification to the community's service system. In other words, there is no expectation of privacy or anonymity when operating on the Habitat

Service System as an intersystems team member/participant.

> **IMPORTANT:** *In concern to an individual's personal information space, the individual him/herself is in control of what information flows into and out of his/her personal information spaces. Hence, once something is open to the rest of the community (i.e., made public), then it is potentially "in the wild" forever, because there is no authoritarian system that can force or coerce its removal from someone's personal information space.*

Also, it is important to recognize that privacy is partially reliant on individual behaviours. For example, a password is private (or secret) as long as it isn't shared; the sharing of the password is a behavior that creates a potential for someone other than the original user to enter the private space. The closing of curtains to "shut out" outside observation is another behaviour. In community, personal spaces have the potential for privacy. Herein, it is the personal user of the space that has the option (i.e., the availability and potential) to choose their desired privacy settings, and to behave in a way that maintains that privacy, which is structurally designed into service.

> **NOTE:** *Community defaults to openness rather than suppression.*

3.17.3 Free expression and speech (access)

> **MAXIM:** *When we allow a society to exist in which we are subject to constant monitoring by authorities, we allow our potential for self-expression to be severely crippled.*

We are each able to express ourselves to our varying abilities to do so, and so, freedom of expression becomes a very strange phenomenon. The very idea of free speech and expression is specifically the freedom from being punished by an authority for self-expression. Fundamentally, coercing or otherwise infringing on the ability to communicate as we like is a dangerous slope because controlling the conversation means controlling behavior.

Fundamentally, someone is either in favor of free speech, or not. There is no free speech at all – zero – if only "acceptable" expressions are allowed. "You" cannot ban expressions "you" don't like and pretend as if there still exists freedom of expression. Free speech exists specifically to allow and protect expressions that offend and repulse other people. If "you" only allow speech and opinions that "you" like, then the next day, somebody else may only allow speech and opinions that they like. If "you" prohibit some form of speech, you're opening the flood gates of further prohibition. Such a naïve populism can come back to bite the initiator quickly, would there be a change of regime.

Angry speech is a symptom of something. If the symptom is removed, the "something" will return with a vengeance. Speech is an important safety valve before violence. If a society prohibits ["hate"] speech, it cannot detect that such hate exists until it manifests itself as violence. Prohibiting speech does not in any way protect against violence. If we notice hate before it becomes violence, we can be proactive instead of reactive. If an authority prevents ["hate"] speech, people inclined to hatred will go directly from hate-thought to hate-violence. Somebody who carries resentment cannot be detected at the hate-thought stage – the hate-speech stage is the first stage detectable to society, which is why you want this, you want to see as much of it as possible. This is when the situation can be addressed by the community through informal and formal means – why are they full of hatred? Banning [hate] speech does not get rid of the underlying problem. It does, however, destroy the crucial safety valve in society before violence appears.

Repressing something pushes it underground and makes it worse. Hateful speech is a symptom, not the cause. When societies repress speech they hide the symptom behind a blind of coercion and punishment, but they don't address the cause, which is still present.

If an environment is triggering fear responses in others as the expression of opinions that are hurtful, then it is wise to consider where community might be insufficiently designed.

If someone simply "cannot cope" with the varied opinions and expressions of others, then the problem may be both internal and external as an insufficiency of esteem and a lack of available tools to differentiate fact from fiction, as well as a general inability to differentiate fulfillment from fear in oneself and others.

In community, we acknowledge and account for the difference between an opinion and a fact. Community is not about accepting or not accepting opinions; it is about recognizing the difference between opinion and fact, having the external tools to investigate facts, and having the internal tools to recognize opinion. Hence, community is not about accepting or not accepting a particular behavior; it is about redesigning the system so that unfulfilling structures and behaviors become visible and are iteratively designed out of the system.

The "culture of offense" is a culture of fear generation. A culture of offense dictates the words we are not allowed to use, the things we are not allowed to say, and the observations we are not allowed to acknowledge. Among community we reject the notion of "thought police" and "word police". In truth, it can be very discomforting and threatening to see what is right in front of you, and unfortunately so, many people turn to the force of government, or some higher authority, to prevent free expressions that they dislike.

Several countries – even those who consider themselves first-world, free-world – have restrictions on what political opinions and words you may utter in public. This is the textbook case of not having free speech, and despite this, those countries tend to keep pretending they have freedom of speech – even to the point where it is written into their Constitutions under ceremonious proceedings, then promptly ignored under a number of exception clauses.

There is a common statement about freedom in some societies: "If you give people freedom, some will inevitably use that freedom in ways you don't like. Is the answer not to give anyone freedom?" Herein, it is relevant to note that there is a degree of confusion present in the speech of above quote, even though the final question is relevant in context. Remember, 'freedom' is not given from authority, and when it is, it is not 'freedom'. Hence, the context itself, "if you give people freedom", is something of a misdirection.

What about the lawful concept of "libel"? In early 21st century society, the concept of "libel" is codified by law wherein it refers to the publication of a false statement that is damaging to a reputation (Read: defamation). In the State-market where entities are competing for resources, someone's socio-economic standing/status can be hurt by the publishing of a false statement. In such societies, the legal (as criminal and/or civil) charge of "libel" can lead to your arrest and imprisonment on behalf of a jurisdictional authority.

In community, however, there is neither a State nor a market, and hence, there is no such thing as "libel". Community does not recognize the legal concept of "rights", and hence, it does not seek to create an all-powerful violence-based monopoly as the "rightful" protector of anyone's "rights". The concept of "libel" only appears to makes sense in the context of an authority that creates law and an environment where individuals are in economic competition for resources. Further, any society that codifies the concept of "libel" is restricting (or, threatening the restriction of) free of speech and expression.

> **NOTE:** *Presently, the Internet represents the potential to freely communicate and distribute information.*

3.17.4 Observation as fulfillment and not surveillance (access)

Information grounded in observations is essential to the resilient development and informed adaptation of a community. We as a community have to ground our decisions on what has actually happened in the world, or else, we embark on a path that is the very last path we want to take because we simply don't know how it will affect the next generation (for, it is a path that decouples feedback).

Observation is inherent to information societies. We monitor and classify information constantly to understand and make sense of the world around us, and to navigate. Both in our personal lives and in our economy, we seek to gather information, to calculate and manage risks, and to increase the effectiveness and performance of our systems.

Observation, however, has two faces, care and control, and can be used in an enabling or a constraining way. It has the potential to give relational power to some groups over others, and when used in this way it can reinforce inequality in society. As 'surveillance' it allows some select groups to monitor the actions of others, endorsing the practices of some, while restraining those of competitors. Surveillance is often applied for the purpose of maintaining a hegemonic social/economic order, and thus, takes on the face of soldiered control and military security. In such a society, a construct like "copyright" is likely to become valued higher than free speech or privacy. Surveillance is often communicated as benign and even beneficial for consumers, and consumers allow surveillance for fear of missing out or being excluded. Yet, surveillance is always done by people who you should be concerned may abuse the data.

4 A resource-based economic [decisioning] model

A.k.a., A resource-based model (RBE).

All economic systems are based generally upon resources, and 'food', first of all, but not all economic systems are based on:

1. A global survey-accounting of resources (i.e., a global resource account).
2. A global plan for the used reconfiguration of those resources into a habitat platform for globally accessible habitat services (i.e., a set of global and local decisions and production plans).

CLARIFICATION: *A real-world decision system is based on accountable resources.*

Some economic systems are first of all based on property (objects), ownership (subjects), trade (process), and profit (outcome of process of trade over time). When there is trade at the societal level, human needs are obfuscated in favor of competing interests (competing at all scales: individual, family, business, nation, State). To actually create an efficient economic system, by metrics of resources and human fulfillment, means the transformation of this prior type of society (Read: market-State type society) into a new, community-type configuration.

The [economic] decision system described herein may be characterized as a resource-based model, because it accounts for resources. In an economic sense, it is a Resource-Based Economy (RBE; long name is Natural Law/Resource-Based Economy, NLRBE), which is a holistic socio-economic system designed and engineered to maintain the fulfillment of individual material service needs through the sustainable and abundant access to services and other productive technologies from a set of common heritage resources via the structural integration of services by means of a habitat service system (which effectively becomes an "integrated city system").

A resource-based economy is an *emergently engineered* socio-economic system, holistically and strategically planned in a participatory-voluntary manner to meet the needs of all individuals in the community. It is a system that relies on collecting evidence, testing ideas, and then putting technical understandings into practical action without the need for price, exchange, barter, or currency (of any kind). It is a systems-based model that accounts for and coordinates needs, resources, and services in the community in complete transparency and with formalized efficiency. It is a system in which resources are held as the common heritage of all the community's (or earth's) inhabitants. A resource-based economy is both an emergent economic design as well as a systematically 'logistical' system. 'Logistics' refers to the logical flow of resources in time-related positioning between their point of origin and their point of use (as "consumption" or "cradle-cycling") in order to meet an "issued" demand requirement. A common-heritage resources-based economy is not a 'monetary-type economy', but a 'logistical economy'. Herein, the term 'natural law' is intended to reference the actual operation of real life (the real-world) versus assumed economic rules and cultural memes.

In brief, an economy based on an accurate accounting of resources is an emergently engineered comprehensive, integrated and holistic socio-economic system based [in part] on the availability of (and access to) resources for re-structuring the effective design and efficient distribution of natures services through systems-oriented calculation toward human- and ecologically-oriented fulfillment without price or currency, resulting in a network of integrated city systems. Cities in a community are integrated city systems (i.e., an example of sustainability in a city-wide design). These integrated city systems are also sometimes known as total city systems. Most of the technologically advanced city systems in an economy based on an accurate accounting of resources come in the form of integrated/total-city system environments (integrated habitat networks). An integrated (circular) city system is often divided into different radial belts relative to functional necessity (i.e., relative to their service of need). Generally, these city systems are updatable and flexibly customizable to the needs, wants, and preferences of their inhabitants. Between cities, nature is allowed to return to its natural state (although, it is still caretaken).

A resource-based accounting view acts as a transparent, formalized planning tool for resource integration, synchronization, and coordination for human fulfillment. A resource utilization plan integrates the direction of human fulfillment with the availability of resources and that which is synchronously known to be technically possible, through global coordination. A resource utilization plan seeks the emergence of a structure that will best be able (i.e., be "responsible") to maximize well-being through empirical measures. Herein, the system is resource based because resources are recognized as a common basis for survival, fulfillment, and well-being. The Earth system is the fundamental life referent. Any philosophy or encoded system that does not heed this referent is unworkable for human fulfillment. It could be said that an account of resources also represents an account of ecological services, which represents a "culture of friendship, community, and collaboration" where we take care of each other and the nature around us.

A "natural-law" view on resources provides an adaptive socio-economic system that may actively derive data from direct physical reference to the "governing" technical regulations of nature as they are emergently known. Essentially, there are verifiable regularities in nature and humanity ought/should understand those regularities, and base decisions off of those known regularities, together, on a social basis for the fulfillment of everyone.

> **NOTE:** *If fulfillment is the purpose, then "governing" seems like a fairly imprecise term if it implies anything other than an 'open systems hierarchy'. Herein, science is useful in the discovery of models that by some degree of probability reflect these technical regularities. In science, the term "governing" does not imply 'hierarchy', but instead, 'boundary'. Community is nothing less than the use of the discoveries of the boundaries of our universe synthesized into technologies which are applied toward socio-economic decisions that facilitate in structuring our fulfillment.*

The "natural law" train-of-thought is simply the acknowledgement of the natural world in an economic system that accounts for resources, and its inclusion maintains an alignment of society and the populations' way of life and methods of economy with the "governing" known "laws" with which everyone is physically bound. An ongoing failure of early 21st century society is to subdue or feed out these "natural law" awareness's (human natural-ability to synthesize information from experience and coherently integrate experience). Note here that an adaptive (a.k.a. 'relational') information systems can synthesize information from its available information (i.e., from a processing space within its own awareness).

The information processing capability of said economic structure is based on an adaptive calculation process for arriving at economic decisions [in part] through information about the availability of resources in an ecological system. Its system's structure may be described in contrast to a 'market-based economy' that uses 'price' to make economic decisions. Under resource-based data, the Earth system becomes a recognized sustainer of life.

A resource-based economic system has following characteristics:

1. It is a system based on the actual, logical operation of the real-life world.
2. It is a system based on resource surveying, resource management, and logistical systems design.
3. It is a system that applies science and participatively formalizes information technology systems.
4. It facilitates the restoration and preservation of the environment and human well-being.
5. Its sole purpose is to work for the betterment and fulfillment of all human beings in consideration of a generational ecology.
6. It involves [at least] inquiry into the transparent availability of common resources and verifiable knowledge.
7. It is global, in its final form.

The organizational structure of a resources-informed economy maintains the following structural characteristics as emergent properties of the total system:

1. **Formal structure:** a commonly formalized description; blueprint; design specification.
2. **Extant structure:** the one actually operating; the current state.
3. **Requisite structure:** the natural one; the one best known suited to fulfill needs.

A resource-accounted society is a holistically-engineered system designed to fulfill a purpose. Although a resourced-accounted society maintains a physical infrastructure, it also exists continuously at the scale of a calculating information systems, engineered for the purpose of material service fulfillment. The system is designed to ensure that people have access to what they need when they need it with a high-quality of living (the highest quality known and available at the time). A resource-based view seeks to maintain the highest possible quality-of-life for everyone in the community given the state of knowledge and resources available, which may fluctuate and evolve, and also lead to the emergent modification of the system itself.

A population that views resources as common doesn't "own" anything, but has access to everything. Herein, 'resources' are considered the heritage of all the inhabitants of the community, not just a select few. It is not a "society" where the few control and distribute the resources.

To be classified as a community-based economy an economic system must have all of the following seven characteristics:

1. *Technological unification of Earth via the 'systems approach'.* In other words, a community-based economy represents the technological and organizational unification of understanding through the systems approach. In solving problems the systems approach follows a process of open inquiry (or open enquiry) toward the tracing of root identities and variables (i.e., root causes). The systems approach necessitates the scientific and critical approaches, which allow for the intentional discovery and identification of a common existent reality (i.e., the real world). Herein, science is the unfolding of discovery in a discoverable universe. And, critical thinking references the intentional and directed will of consciousness toward higher states of information entropy and higher states of potential in reality. An intentional community studies nature with intention; we create meaningful and purposeful systems to more fully develop our potential selves

2. An *emergent* and *systematically engineered* design based upon *commonly verifiable, scientific information*. Community is an emergent system, because society is emergent; it is continuously being adapted, updated and revised based upon humanity's most current and verifiable systematically scientific understandings and engineered technological capabilities (i.e it's not a static or established culture).
3. *The continuous application of the scientific method* to more accurately inform the total information system.
4. *Coordinated access instead of property*.
5. *No currency, no money, and no market system* for the transfer, transformation, production or distribution of common heritage resources, goods and services.
6. *Automation of undesired/unsafe labor and technical processes*. A system designed to minimize and eliminate repetitive and unnecessary work.
7. Self-contained *localization* and *integration* of service systems into a total habitat (or "city") system infrastructure using systems-based *logistics* for the fulfillment of all human need and preference. The type of logistical service integration described here is also sometimes known as: an integrated city system; an integrated habitat service system; and an integrated [global] access system. Herein, an 'integrated service system' refers to the total environment that provides access abundance to all individuals in the community with the highest standard of living known and possible for everyone given the resources and information available.

One of the intended purpose of accounting for resources, as a participatively designed system, is to identify the root causes of socially corrosive behaviors while iterating its own design; this produces a capacitive potential for reducing the continued likelihood of said behaviors. One way to do this is to give all individuals in the community access to life supporting and life enriching goods and services without a price tag, without a need to commit to labor, and without the existence of coercive institutionalized forms of violence like the State. Law is a response to social insufficiency in a society and it is indicative of authoritarian power structures. The victims of socio-economic problems are often made into "criminals" through "legislation". During transition, there is the transition from the market-State into a society that accounts by "natural-law" what is needed for human fulfillment by the individuals themselves, at the local habitat level, through a system that accounts at the globally networked [community] habitat scale.

A resource-based view observes:

1. The application of science and technology for the benefit of human co-existence.
2. Socio-economic decisions that involve everyone benefiting without some benefiting at the expense of others.
3. An environment in which all goods and services are available to everyone without the use of money, barter, liability, credit, debt or any other form of servitude or coercive force.

A community-based view could be more simplistically broken down into three general components:

1. A collaborative information system with design and demand interfaces. Working groups create user information systems. Working groups create working group information systems.
2. A resource coordination (or logistical management) system that accounts for demand, value, measure, and feedback. Habitat teams create habitat services for themselves and all others.
3. Informed and formalized macro-calculation [inquiry] for structuring a decision space and arriving at optimally oriented design decisions [in a probability space]. Decision working group teams formalize the next version of the habitat network (local and global).

4.1 Historical context of a "resource-based economy" (RBE)

DEFINITION: *An economy based on an accurate accounting of resources is a resource-based economy.*

The essential conceptual components of a resource-based economy (RBE) were put together (in part) and made known globally through the work of Jacque Fresco and Roxanne Meadows at The Venus Project in Venus, Florida, USA. And, it is with thanks to The Zeitgeist Movement and its founder, Peter Joseph, that a resource-based economic systems model (a whole Earth systems model) has reached the level of comprehension and global support it presently has. The Venus Project has been an inspiration for millions to come to know that a better and more integrated way of living is possible, through total city-system design and optimized production. Before them, there had been significant prior published thinking on the matter, both in terms of the design of a community-type society itself, and in terms of critiques of the market-State. In many ways, the socialists and communists of history were trying to create something similar, a money-less, State-less, class-less society, and approached the solution from their own historical environmental contexts.

In some respects Buckminster's "World Game" was the progenitor of the resource-/systems-base as a thought-out conceptual model. In 1961, Fuller developed what he referred to as an educational simulation in an effort to facilitate the creation of solutions to "overpopulation and the uneven distribution of global resources". It was a game with the supposed intention of communicating knowledge about how to manage resources and meet the needs of the total population holistically; how you bring all of humanity up to the haves ensuring there are no have nots. That was his game. Yet, from where did he get the idea for the game? It was a version of a war game. While in the military he realized that the military didn't have the restrictions inherent in the market. He noticed a relationship between the "market" and 'efficiency' in the fulfilled well-being of everyone on the Earth system. He noticed that when something needed to be done by a "professional military", the military did it, and they did it quickly and efficiently because they could do it that way. Granted, there is still a lot of inefficiency in every military; but midway through the 20th century western military powers were considered by many to be "engines" of efficiency. The atomic bomb is a result of said efficiency.

Engineer R. Buckminster Fuller thought of the idea of running a global [calculated] simulation to "make the world work for 100% of humanity in the shortest possible time through spontaneous cooperation without ecological damage or disadvantage to anyone". The simulation is a rational thought exercise, a relational logic puzzle that uses what is known concerning scientific causality/probability [as opposed to the "wheeling and dealing" market competition]. It says that a society can do better than a superstitious faith in some invisible hand, or figure, or entity of the market that knows all and sees all. Fuller's logic is based around the Earth and a natural rule set, the known laws (or technical principles) of science. It is based on seeking to understand nature and working within our understandings of nature.

4.2 *Economic stability*

> **INSIGHT:** *True economic stability is human stability and ecological regeneration, based on life capital as opposed to industrial and financial capital.*

A resource accounted model is a stable-state economy in that it does not have a growth directive; instead, it has a living within the capacity of the environment directive. It is designed to account for the necessity of remaining within the boundaries set by the carrying capacity of a particular environment, while also accounting for those variables that impact carrying capacity (e.g., technology). Zero growth is not a crisis. Some economic models require infinite growth, scarcity, and repetitive labor & consumption. The resource-accounted model's directive, if it were said to have one, is to support [the growth of] consciousness in its evolution beyond the artificial boundaries that separate people; essentially, this is its unifying imperative. Essentially, a resource-accounted design seeks to maintain a "stable" economic environment - an environment where individual's needs are sufficiently fulfilled such that they are developing toward their highest potentials.

Stable economic environments must maintain at least the following three conceptual considerations:

1. **Resource accounting** - A resource-accounted organization accounts for the existence of identifiable resources. Truly effective 'economic resource allocation' cannot occur unless the economic system has a clear and transparent understanding of what resources are available and their qualities. The allocation of resources in a system will become sub-optimal if the system has any lack of awareness of the availability of resources.
2. **Dynamic equilibrium** - A resource-accounted organization scientifically responds and adapts to changes in its environment through the mechanism of feedback. Dynamic equilibrium is the steady dynamic-state of a system wherein forward reaction and backward reaction occur at the same rate. Multiple dynamic equilibrium adjustments and regulation mechanisms make homeostasis possible. A resource-accounted organization tracks the rates of change and of regeneration of common resources. The use of Earthly resources requires a 'balanced load' economy involving dynamic equilibrium. The term 'balanced load' is used to identify the establishment of a state of equilibrium between all material and non-material (e.g., power) flows during the materialization and transportation processes of goods. The goal of a 'balanced load' is to find the ideal balance for the load (material and/or non-material), making it possible to utilize all available resources with the greatest degree of efficiency. Additionally, a balanced load also is designed to allow the greatest degree of safety for those working with or near the load itself. In concern to the economy as a whole, the production of goods and services must balance with the resources nature is capable of providing (i.e., natural services). It is unwise to exhaust resources just to maintain "labor" and an inherently unstable economic system. If dynamic equilibrium is not maintained within a system then the system is said to be 'unstable'. Biological systems all have negative (or corrective) feedback mechanisms whose purpose is to maintain the system in a state of dynamic equilibrium within an environment. For example, in a human's neurophysiological system the process of environmental adaptation is known as neuroplasticity.
3. **Strategically designed for desired access** -

resource-accounting service systems are designed and engineered to meet the [serviceable] access requirements of individuals; they account for 'access'. Herein, **strategic design** is a means of efficiently meeting the spectrum of human needs on a finite planet in a sustainable way [over time] and generating 'access abundance' through greater efficiency. Strategic design requires the strategic optimization of resource allocation toward the preservation of the common fulfillment of needs. Strategic designs allow for the maximization of efficiency. Strategic designs recognize time as a factor. If "you" have no strategy, then "you" have no strategic plan. Without a strategic plan, system-wide organization lacks an intentional focus. Fundamentally, strategies exist to address needs and deficiencies.

The exclusion of these three conceptual considerations from inclusion in an economic model would be considered 'negligent' from the perspective of a society that follows the systems approach. These are mechanisms that sustain the state of need fulfillment in an ecology. These mechanistic strategies are programmatically applied to the emergent design of the resource-based systems architecture. Wherein, they are encoded into the iterative design of the habitat service system through the formalized mechanistic structuring of decisions.

An economy (socio-technical society) is an engineered system. Engineered systems are designed and operated (only) to achieve a functional purpose. When a programmatically designed (or engineered) system is in operation, then decisions are 'formulated' (i.e., they are arrived at via an information formula). When decision systems are optimally informed, then their 'selected decisions' are optimally align-able.

INSIGHT: *Why apply protocols and algorithms? Because there are too many things happening all at once in a socio-technical society for one person to pay attention to all of them.*

4.3 The global coordinated access system

NOTE: *In a resource-accounted access system, concepts such as, "investment" and "marketing" would cease to exist because selling would cease to exist. Instead of "marketing", systems would be in place to 'inform' the society of what is available and what is occurring (i.e., transpiring and happening) so that each individual may more intentionally participate in ensuring continued access to the services and systems that structure their environment.*

The Global Coordinated Access System is the top level system in the resource-accounted architecture. The objective of this top-level system is that of strategic access, which refers to the idea of meeting the material service needs of a population, whatever they need, when they need it. In other words, we have access to what we need, when we need it with an accompanying high-quality lifestyle. The global access system redefines "wealth" as 'strategic access'. The global access system is decomposed into macroeconomics at the systems dynamics scale, and microeconomics at the scale of local dynamics.

The purpose of the Global Access System's design is to provide access abundance and resiliency in the fulfillment of the economic needs of individuals in a community. It is an autonomous distributed structure, to which a set of value-oriented information processing strategies are applied through the formal encoding of a mutually developed set of economic protocols; hence, there is no need for an administrative class of "governors", for "government". Protocols (or standards) are a type of "convention" that everyone can follow to use a service.

A resource-accounted system is principally composed into an access system that creates a fluid means of sharing useful resources, goods and services, which may not be needed at all times by a single individual amongst a community of connected individuals.

In a sense, a resource-accountable could be described as a set of scientific-engineering principles that form a technological platform for "running" [systems] protocols (i.e., information transformers) within the digital and material information space that schedules the prioritized coordination of common resources in a material habitat.

A global access system allows availability to everyone on an equal basis.

NOTE: *Everything in medicine is a checklist, everything in avionics is a checklist. We can classify, categorize and codify a process for coordinating our own fulfillment [aligned with nature].*

4.4 The structured behavior of a resource-accounted system

A resource-inclusive economic system accounts for the empirical "life-ground", the natural environmental services from which everything we develop and construct is derived, and which every human being shares as a need regardless of their philosophy or ideology. In a resource-accounted system, resources are provided by a common natural[ly serviced] environment.

A resource-accounted design is itself a recognition of the imperative of linking the environmental impact of the usage of resources with the economic decision process itself – systems processes maintain this feedback characteristic. This occurs at a voluntary social level wherein individuals maintain a global community commons, a place where people can access goods and services from a 'common resource pool' without the market.

Under a resource-based economic model all of the community's resources belong to the community in-common and are held as the 'common heritage' of all of the inhabitants. The term 'common heritage' refers to the coordination of resources to prevent exploitation [by any individual or group], and it is closely associated with the term 'environmental caretaking' (or stewardship). It is essentially the opposite of the market rationale that everything is for sale, and nothing is sacred.

A garden well-tended by people capable of tending it moves toward a lower entropy system. Caretaking (or stewardship) is a process of influencing one's environment toward lower entropy, and hence, greater fulfillment.

A resource-based economy is designed not to reward or reinforce exploitive behaviors. In a market-based system, people are marketed and socially conditioned to have desires that are probabilistically going to be socially frustrated. When the market-conditioned desires are not realized, then the probable likelihood is that of a socially frustrated psychology carrying the sense of dislocation, isolation, and alienation.

We belong to a single planet, which functions as a single, symbiotic system. A resource-accounted design is characterized by the concepts of questioning, bridging, and holism. When problems arise, the system is designed to seek systematic knowledge of the problem while bridging the gap toward a holistic solution.

4.5 True costs in a resource-accounted system

NOTE: *The true cost to failures at fulfilment are personal and socio-economic.*

The resource-accounted model accounts for what are known as the 'true costs' (i.e., "true cost economics") of its own system on the natural and social environments, including its:

1. Resource costs (e.g., resource regeneration).
2. Social costs (e.g., behavioral changes).
3. Environmental costs (e.g., environmental damage) in an effort to understand what is possible and optimal within a given environment.

A true cost economic system accounts for the true cost of economic services on all habitat [service] systems. And, it makes explicit the economic services available to the community. The idea of "success" within such a system is defined by what someone contributes to humankind's development and how they are themselves developing as a human being, rather than the acquisition and accumulation of artificial wealth, property and power.

A resource-based economy is a 'true cost' economics system because it [at least] accounts for the cost of negative externalities (i.e., in the market these are known as "non-transactional interactions") and de-prioritizes designs, and goods and services that cause damage to the habitat environment. It is important to mention that the current global monetary market economic system does not (and cannot) account for externalities. And hence, it is a disconnected model - a model disconnected from the lifeground from which all needs are sustained - it is an erroneous and ambiguous model that leads to the further confusion of those beings who have adopted it as their "truth" (or "religion").

Generally, externalities are mistakes, and not intentional. The designers didn't intend for the effect, but it was realized anyway and caused harm. In community, when producing a solution, it is important to factor secondary and tertiary effects, and identify where they may be recoverable and irrecoverable harm. When seeking to observe harm in the environment, there may be events that were not predicted, so ecosystem monitoring systems may be used. Anticipating second and third order effects takes time and analysis. In the market-State, businesses and States do not want to take the time to fully analyze situational externalities, because if they take to long, some other competing organization will out compete them in bringing their product to market. So, there is an incentive to either not look for where is going to do harm, or do a superficial job at looking for harm. An "externality" is something which is out of sight, and when "out of sight", then "out of mind", something external that is doing harm, and ought to be factored, but isn't.

INSIGHT: *In the market, profits (gains) are privatized and losses are socialized.*

Any system which prefers market operation over sustainable operation of life systems on the planet will fail to sustain human fulfillment. All systems will fail if they don't understand their environmental consequences, as well as the requirements of their environment (including, the fact that the system cannot be separated from its environment).

Any economic model that conceals the true costs of its actions is neither a viable nor desirable (nor even sustainable) economic model. How can an economic model that does not account for resources in its decision process even be called an economic model? Resources allow for the existence of goods and services. If resources are not accounted for in their totality, then an accurate measurement of goods and services as outputs of the economic system is not possible.

A true economy is characterized by gradual increases in efficiency as information within the community becomes more coherent. A true economy is scientifically correct, and therefore, not informed by opinion or bias. A true economy is based on what is known of the real world. A true economy involves contribution by a social group of individuals. A true economy does not compete with itself because it sees itself as a system.

The scientific discovery of scientific principles is the best common method known for verifying and predicting our common physical reality. The scientific method is a body of techniques for investigating natural phenomenon, acquiring new knowledge and the self-correction of previously ascertained knowledge. Our understandings of ourselves, our environments, and our ability to design fulfilling structures is advanced through science - a community is advanced [in part] through science. If applied openly, science can lead to the maximization of the quality-of-life and -living of everyone in a community, while preserving and caretaking the habitat.

Observably, the scarcity of resources, goods, and services has a detrimental effect on the behavior of humans. A true economic calculation as defined earlier conceptually formulates how abundance on Earth for all human needs is possible today.

We can produce goods in a regenerative manner on our own, without business or industry. We can build sustainable structures to meet our own needs, without governments and utility companies. We can grow good food to feed ourselves. We can develop productive service technologies. Our motive is not profit, but the benefit of ourselves and the community we have chosen to associate with. Daniel Pink, the author of several modern discursive sociological works states, "profit-driven approaches relegate purpose to a nice accessory if you want it, so long as it does not get in the way of the important stuff".

In the commercial world, asking "why we do what we do" can result in answers of "because it is cool technology", "because we will get more money", or "to support the business objectives". Therein, a purposeful understanding of why some thoughts and behaviors might lead to greater and lesser states of fulfillment represent potential commercial competition to profit. The outputs of commercial enterprises are achieved by carrots and sticks that are proportionate in magnitude to the risk of the endeavour. In commerce, questions about meaning (i.e., why questions) beyond these three pointed answers as to why we do what we do are likely to be met with silence, sneers, or puzzled looks. And often, a continuance of such questions are met with the termination of one's career.

Here, it is important to remember some of the ways by which resources are squandered in early 21st century society. The following scenario is a frequent occurrence in early 21st century society, particularly in governmental and corporate environments. If there is a budget and "you" are a department that gets a portion of that budget among competing departments whom also receive a portion, then it is in "your" [departments] best interests to use all allocated funds (regardless of their actual need) every cycle so that you maintain the upper budgeted allowance. For, there is a risk that if you do not use your upper budget allowance this cycle, then next cycle that allowance might be lowered, which might also perceptually reflect a lower social status among the competing budgeted departments (when social status has a relationship to financial status). In the intelligence industry this type of scenario directly concerns the notion of "mission creep". A team will keep "creeping" its mission (i.e., mission objectives) forward to maintain or expand its own budgeted financial allowance.

4.6 Moneyless fulfillment in a resource-accounted system

> **INSIGHT:** *People don't really want money, they want access to things that money can provide under a certain socio-economic context.*

A resource-based (accountable) economic system functions without money; it is a moneyless economy. It is the economic equivalent of the evolution of self-understanding, of computation, and of engineering and automation, which are applied to the benefit of all of humankind. A resource-based fulfillment oriented system is designed to maintain access abundance to economic services without the use of a medium of exchange, gift, barter, or currency.

If there is no scarcity, then there is no reason for a medium of exchange. Resource scarcity is transparent in an common-heritage environment, and hence, when 'critical resource scarcity' (vs. manufactured) exists, then the family (or community) adapts, which some systems allow for and others inhibit through the systematic generation of adaptive or maladaptive processes and behaviors. Scarcity is a principle generative condition of a monetary market-based economic system, and therein commercial entities (i.e., people) have to compete (or fight) for money, hence differential advantage, hence gaming strategy, hence dishonesty, hence corruption, hence the modern world around us.

By removing the monetary system from the manner in which human needs are fulfilled, the mechanism of differential advantage is removed and "integrity" becomes the understanding that the integrity of social and environmental systems is directly related to your own personal integrity. In a resource-based world, it is in everyone's best interests to preserve a system that is designed to maximize the fulfillment of everyone's needs; hence, there is no clash of motives like there is in the market system where people [more often than not] pursue their own detached, conflicting, and narrow self-interests (vs. rationally thought-out self-interest). In this sense, a resource-based society does not maintain and reinforce mechanisms that corrupt individuals (i.e., "corrupting mechanisms") that are ever present in a monetary system. Instead, it is a structure that is responsively adaptive to its users and its environment.

In a resource-based society there is no need for money, labor, or gift as a means of exchange. Principally, 'money' (i.e., the monetary system) is an essentially corrupting force; one that generates its own reality in the minds of those who believe in it. It is a remarkably dynamic strain of corruption, generating con-artistry and predation behaviors at all levels. Also, rather than focusing on economic labor as a means of exchange, labor is sought elimination to entirely through automation of service processes [where desired].

From a behavioral perspective, the need for cyclical monetary earnings to maintain one's standard-of-living is dangerous to well-being; it incentivizes behaviors with harmful (i.e., harm inducing) social costs.

The entire field of modern economics presumes the necessity and existence of money - everything an "economist" states presumes its axiomatic presence. The entire field of modern "economics" is like a fish in water that doesn't realize there is a different atmosphere above or that there is such a thing as "land", which it bumps into on occasion, but doesn't quite understand (e.g., the commons and open source).

The market propaganda is that if someone doesn't like a particular business or industry, then s/he should vote with their currency (i.e., spend their money elsewhere) - if you don't like a company, then you should just not use them. Unfortunately, such behavior is not an actual solution to real social problems. It is not a solution because [in part] the market system re-enforces pressures to purchase from the worst manufacturers, because they are the most cost efficient and make the most affordable goods [for most people]. In the market, caring is a convenience; it is a luxury to care about the quality of the food you buy or the quality of the goods you purchase. Mostly, those who care to purchase otherwise can afford to care. Yet fundamentally, everyone is in deficiency in this model.

In a monetary society it is not irrelevant to note that the modes of communication we use are tightly coupled with the modes of production that finance them. An untwisting of words can be useful.

When life needs become a commodity, then everyone suffers. A resource-based society is designed to service life needs and not manufactured, commercially oriented wants. When "you" travel do "you" have to pay in order to sleep somewhere comfortable? This type of a commercial transaction represents the subtle commodification of a life need (a restorative sleep environment). The commodification of life needs are aberrant and harmful, yet culturally normalized in early 21st century society.

A resource-based society removes the monetary profit incentive from natural-logical economic processes. The profit incentive at a societal scale inhibits progress, stifles efficiency, promotes violence and exploitation, while it surreptitiously engineers scarcity out of the very structure of its system. In other words, the structure of its system generates these systematic characteristics. Essentially, these are some of the behavioral characteristics of an economic system that maintains the encoded conceptual value known as "profit". Early 21st century society extracts profit in the form of *property* and *price* at the expense of all human needs. Fundamentally, everything good that is happening now, in early 21st century society, could happen more efficiently and more effectively without money.

In a monetary market there exist "market entities" who employ a whole host of strategies in competition with other market entities. The use of propaganda is one common strategy. Entities employ strategies to maintain market share, maintain profit, maintain liquidity, maintain customers, maintain their establishments and institutions, maintain their product line, maintain their valuable employees, maintain revenue, maintain service, maintain growth, maintain leverage, and maintain competitive advantage (i.e., economic power), to name just a few. Some of their strategies are known as "business strategy". Business strategies often (if not always) work in opposition to the design of resource-based, sustainability strategies for optimal fulfillment. Hence, if someone were to participate in a business strategy, in general, it could also be said that they are not participating in a sustainable systems strategy. Whereas 'business' is a process of competition, the design of a sustainable system involves a recognition and integration of networks of cooperation. A business strategy is not a solution orientation that accounts for the largest known system and all available information. Business strategies exist within market economies and are not a part of resource-based systems economy which does not, in fact, have "externalities". Business strategies are competition-based, and often, infinite-growth oriented. A resource-based economy applies cooperative, systems-based strategies [with an intentional recognition and design of the systems overall purpose].

Infinite growth is infinitely absurd. For purposes of sustainability, it doesn't matter what kind of technology arrives if the [consumer-ist] mindset doesn't change. The major motivation in early 21st century society is and only can be concerned with "how do I get money to meet my needs and the needs of my family?" Money is a principal motivator for the majority of human behavior on the planet right now. By and large the thing that constrains the human society is the truthful statement, "I have to survive by making money."

We will not have abundance while we continue to use the means that generates our own enslavement, while we continue to use "money".

Truly solving problems in a monetary system ebbs the flow of money. If "you" were to actually solve a problem, then the flow of money would dry up. And hence, for those whose satisfaction and survival is based upon the flow of money, and even for those who have the "best of intentions regardless of money", if money is a re-occurring part of the "solution", then it is not a real [world] solution.

Rather than having money it would be useful to have tools - things that make other things. And in a community, once "you" make anything "you" become part of a network of other makers.

> **INSIGHT:** *Money harms society by generating a state of wealth disparity in the population.*

4.6.1 Structural goals and artificial scarcity

> **NOTE:** *Understanding the resource based doesn't make trade or gifts or exchange "bad"; instead, it simply makes these things irrelevant to individuals survival and fulfillment in society; it*

makes them obsolete.

All economic systems have structural goals, which may not be readily apparent.

1. The market capitalism structural goal is growth and maintaining rates of consumption high enough to keep people employed at any given time; employment requires a culture of real or perceived inefficiency and that essentially means the preservation of artificial scarcity in one form or another.
2. The natural law resource based economy's goal is to optimize technical efficiency and create the highest level of abundance possibly within the bounds of Earthly habitat sustainability, seeking to meet human needs directly.

Resource scarcity has a perceptual dimension to it. In a family situation, when something becomes scarce, the family "works its way around" the scarcity either by focusing their sharing more precisely or developing an alternative resource to the actually scarce resource. In this sense, there is never really a scarcity problem, there is a resource problem, which may involve a coordination, production and distribution problem.

Scarcity greatly depends on perception. Generally, elemental resources for the sufficient fulfillment of all human needs are all abundant, but the productive mechanism of society is what makes them scarce. There is a fundamental difference in the perception and usage of resources between cooperative creation (i.e., co-creation) and competitive production.

NOTE: *The concept of "free" is different from that of "selective". In 2013, in Scandinavia, the local universities are touted as "free" [though they are still paid for by the public], and people are still selected to go [to universities of different calibres].*

4.6.2 Simplified societal economic inner workings

The following is a cursory example of how price works in the modern electronic market: Someone walks into a modern grocery store in the market and buys 3 bananas for a dollar. This data is communicated to the [enterprise] transaction process system of the grocery store, which updates its inventory system to reflect "-3 bananas" (minus 3 bananas). This information is then communicated to a larger web of interconnectedness that is the claimed market system to which is add the information "-3 bananas". Entities in the market then looks at banana consumption purchases throughout the rest of the economy, wherein the rate at which they are purchased is weighed against the price at which they are purchased, and the market essentially [is said to] self-regulate itself by updating how many bananas should continually be produced to correspond to the identifiable market and price consumption levels.

In an natural law/resource-based economy, this [calculation] process would work in almost exactly the same way. Someone enters a distribution [sharing / checkout] center (or places a demand into the information system) and takes what they need [without payment]. That demand / access is tracked (and becomes a data point, rather than price being the data point). An information system calculates demand-access in real-time and adjusts the running, qualified production of how many bananas to produce to meet the real, trending and estimated demand.

In truth, many people in early 21st century society due to the layers of confusion therein, would have a hard time imagining the smoothness of a transparent economic-decisioning information system. Yet, a community can make very strong calculated predictions of requisite 'variety' (cybernetics term) if it has sufficient data. Wherein, the system simply adapts to increased demand and other environmental signals.

4.7 *Irreducible scarcity and resource-based accounting*

NOTE: *In a community-type society, the economy is understood to be part of the ecology, and the decision process reflect this recognition.*

Irreducible scarcity may still exist in a resource-based environment as an appreciative challenge to be overcome for the betterment of everyone. The temporary irreducible scarcity of what is essentially a functional resource represents an opportunity for creative innovation. A resource-based society accounts for the application of resources, technology, and intrinsically motivated individuals to eliminate all forms of superficial scarcity. Scarcity presents an opportunity for the growth and coalescence of information within the community to form new processes and technologies to overcome scarcity, and evolve our means of preservation and of fulfillment. If irreducible scarcity causes conflict, then there is [at least] a need whose requirements (pseudo or real) are not being met.

As long as a society studies what is being "bought" and uses that information to inform its economic system, as opposed to what is being measurably 'fulfilled', then such a society is always going to come up with the wrong conclusions. In the real world the proper study of economics is the design of real world fulfillment, not market consumption. In a market-based society it doesn't matter how the market is measured, such as a society is measuring the wrong thing. What matters in this world is the fulfillment of needs and of our aspirations to grow, develop and become everything that is latent and potential in each of us. The fulfillment of human beings is most clearly seen in how they relate to each other, and particularly, their children. As we separate ourselves further from our true nature there is a great sadness that calls a return to our humanity [not to purchases, consumption and isolate]. Is this not the greatest longing and freedom we can have, to be in community with each other.

The resource-based view is a coherent, integrated total systems approach for understanding what resources are available and how a real resource shortage (not subjectively perceptual scarcity) are overcome.

> **NOTE:** *If the work is uninteresting, but must be done, the question is, are you doing your work with the intention of not having to do the same work/task again at some point in the future? Even the brain and mind automates processes; why should society not automate technical processes?*

4.8 Availability of access to human need fulfillment in a resource-based economy

> **INSIGHT:** *It is not our economic resources that are scarce, but intelligently applied passion for the betterment of oneself and everyone else.*

The resource-base of a system exists for the expressed purpose of producing an abundance of access (i.e., “access abundance”) to needed and preferred ("wanted") goods and services. If individuals have free access to the goods and services that they need and prefer/want, then the concepts of “trade” and “property” are unlikely to exist in their social system or be encoded into their economic system. Hence, a resource-based economy is a truly voluntary system. In other words, individuals are not bound by trade for property or movement in the system; instead, movement and access are provided freely. A community that designs its own economic system might seek to create a voluntary environment that brings out the best of human behavior.

When educational, creative, and explorative resources are available to all without a price tag, there would be no limit to the evolution of human potential. Community necessitates a fully open learning system for a truly open society. When a society is unburdened by chronic survival concerns, then people would have time for individual intrinsic learning and exploration. Education, if available to everyone without a price tag, could become a never-ending process, a lifelong intrinsic learning process. Communities are living learning centers (e.g., like “universities”). Most people would participate in activities and pursuits that they enjoy and that make them more highly developed and fulfilled human beings.

4.9 Technology under resource-bound economic conditions

> **INSIGHT:** *Eventually all of our doable work will be doable by automated robotic machines. How, then, do we wish to live [as a species]? We must ask, to what extent are automation technologies improving our humanity and our fulfillment, and to what extent are they disrupting our humanity and our fulfillment? How do we integrate them into our social purpose so they are helping us in our desired state of fulfillment, individually and as a society? How do we use them as tools in order that we might flourish as human beings?*

The resource-bound model is deeply informed by the understanding that a socio-economic system must remain in alignment with a community’s technological capabilities to maintain the social stability of the community. If technology exists to free humans from banal or dangerous labor, then the socio-economic system must evolve (change for the better) and adapt to this new technological way of meeting needs. If automation technology exists to free humans from repetitive labor, then again, the system must adapt. If adaptation is not preserved then community destabilization is more likely. Of course, not all technologies are novel enough to cause a socio-economic adaptation. But, when those technologies that evolve the social environment begin to infect the economy, then to remain stable, the economy must evolve alongside. Mechanization is more productive and efficient than human labor, which means it is socially irresponsible to not mechanize and enjoy the fruits of abundance and ease and satisfaction it can create.

All technological decisions in a community are also social decisions as they [in part] involve common heritage resources. In a sense, fulfillment-oriented the technologies are an extension of a fulfillment-oriented social structure.

In a resource-bound economy, the actual Earth [eco]system becomes the basis for decisions in the economy. Instead of “affordance through monetary transaction” there is “affordance through regenerative Earth capacity”. Community represents a transition from a “labor for income” system to an access-contribution [abundance] system without “differential advantage“ or having to submit to the opportune (or incentivized) dominance of another for one’s own need satisfaction.

When technology is systematically applied, it conserves energy, reduces waste, and provides a more efficient and effective economic system, as well as conveying a larger decision space. Eventually, technology itself will have advanced to such a degree that the technological landscape mandates a systems-wide resource-based economic model.

The introduction of automation machines into the methods of production decreases the effort expenditure of the individual in the production of goods and services. Engineered automation leads to more effective and efficient technical need fulfillment. Herein, non-human productive service resources are maximized and human time becomes free for the meaningful.

What is the purpose of technology if not to produce abundance for all the worlds’ people? This very day we have the technological know-how and resources to produce abundance for all the world's people. Why aren't we doing so? How do we actually relate to one another if we don't realize that each of us has an innate drive toward a higher potential for ourselves and others, that each of us has common needs and common inter-relationships? Can an economic system influence how we relate to one another?

By applying the tool of a resource-based access system that maximizes the [systematically] functional use of every good, along with intelligent resource management, and near complete automation of primary services and goods manufacturing, then a community has the potential of creating a society of economic efficiency and useful abundance. This results in something which has never before occurred in human history; it generates an economy where goods and services are available in such abundance, and with such little need for human labour, that there would literally be no reason for money, barter, trade, or debt of any kind. A fully functional community may be said to "come into existence" at approximately the time that fulfillment becomes a sufficiently automated process that there is no potential re-initialization of the idea of the "market".

When efficiency is valued, automation is sought, and the concept of material exchange between humans no longer holds any relevance. We seek that which is mutual. Instead of exchanging goods and services for their survival, we openly share information for our betterment. Humankind is presently in the process of closing the chapter on the time in history when humans produced and distributed every good and service. Machines are increasingly replacing human effort, which isn't to say that in a resource-based society that individuals wont still be highly creative and artistic with their hands and bodies. In an exchange-based system an exchange is necessary to maintain the flow of goods and services. In community, a common resource-based, combined with intention and purpose, are necessary to maintain the fulfillment of human needs with goods and services. When machines perform all the banal and duplicitous work, then the exchange of resource for survival no longer need occur between humans. And, to remain in balance with their technology humankind must adjust its socio-economic environment accordingly.

It is relevant to point out here that humankind's current state of technological development is such that some of its technological systems are themselves being designed, constructed and maintained by other technological systems, which is somewhat less commonly known as "automated automation" (indicating that the operations replacement layer is automated also).

Because all technology can be used for "dual purposes" (as betterment or weaponization), it would be wise to establish a socio-economic system that reconnects the economy, society, and technology with the natural world so that technology is not used as a weapon in competition among one another, but with the intended fulfillment of everyone. There is a large experiential difference. Anything can be weaponized and turned to harmful purposes, including the wish to keep children healthy by vaccination with mercury, or to prevent tooth decay by putting a fluoride by-products in the water. If someone else controls what may or may not, should or should not, must or must not go into your body, then you are a slave. And that is the essence of the slave State. Somebody else controls what happens to your body. If only you have 'personal access' to your own body, then you have to take responsibility for it.

Those who do not understand technology, who do not comprehend the basic conceptual designs of technical systems do not generally appear to have an appreciation for the capabilities of humankind and its current state of technological development. If someone does not understand even the basic operation of something, then how can that individual truly appreciate its operation or conceive of lateral operations? This very year, we are a technically capable species - we have been to the moon and back, and we are autonomously driving around on Mars at this very moment. Our scientists, mathematicians, and engineered began creating vast architectural structures decades ago. Consider for a moment the advanced mathematics and physical understandings that it takes to accomplish the sustainment of the modern technological infrastructure around each of us. At this very moment, here on Earth, we have mathematicians, scientists, and engineers who could solve our greatest social, and fundamentally, technical problems as rapidly as the next updated release of your smart phone. As a society, would it not be prudent to use these skilled individuals to solve our socially-oriented world problems? Only under a predatory-based system [economic parasitism] would we stifle our own social progress.

The monetary system wastes limitless amounts of resources in the replication and duplication of products that are not necessary, and it is a place where some goods and services become contrived to us. We are coming to know more about what we need, and why and how we come to like things.

Exponential knowledge acquisition and technical development leads to the transcending of material scarcity and engagement with a more thought responsive environment. At this very moment humankind is in the process of such a transition. Technology allows for new possibilities, the eventual consequence of which is a highly thought responsive and customizable environment. In all honesty, if technologies continue to advance, even at a fraction of the rate they are now, services are going to look increasingly less like jobs and more like thought responsive science fiction. It is hard to offer your labor in an economy that is full of automated machines. Take the software application Photoshop for example, any 2D image you can dream of you can re-create, re-copy, and re-print in digital form. Similarly, 3D software and 3D material rendering technologies (e.g., 3D printing) allows for the physical creation of nearly any structural-architectural object imaginable (within material limits, of course).

Real things don't vary by opinion. "You" can think (or believe) that iron is stronger per measurable attribute by comparison with another metal as much as you want; but, if you can't prove your opinions through testing, prototyping, and experimental controlling, then they are irrelevant to the selection of an optimal material for a projected service. This is just basic engineering. Many people in early 21st century society do not have a complete and functional understanding of what 'systems-oriented engineering' actually is, remember that.

Here, technology as a functional extension of our cognitions allows for the simultaneous processing of (or 'multiprocessing') of information. Atoms are bits of information. Structures built by humankind are also information. In a sense, technology represents information about how to make environmental responses or processes run more efficiently and require less energy, like enzymes do in our body or platinum does in catalytic converters.

> **INSIGHT:** *Technology ought to evolve our humanity; if our technology were to surpass our humanity, then humankind would be at risk.*

4.10 The scientific method and resource accounted economics

The resource-input into decisioning involves a scientifically derived process that unfolds objectively toward a higher potential of human fulfillment through contribution and an information and spatial support structure. The resource-based model model uses the scientific method for quantifying the impact of its own technologies and actions on its environment [through 'scientific feedback mechanisms']. Would it be wrong for a community to agree that a product or activity that causes harm to the environment or any human being, either in a direct or indirect manner, should be de-prioritized in accordance with its potential for harm? Herein, a resource-based view understands equitable systematic prioritization of resources through community-wide access to accurate information and voluntary participation. With feedback humanity can come to know what conceptual and material structures have the potential to cause harm, and it can remove these structures from our life-space.

Applying the scientific method to partially solve for socio-economic problems is only logical. Science is unique in that its methods demand not only that the ideas proposed be tested and replicated, but everything science discovers is also inherently falsifiable. Science never attaches to anything, and it evolves constantly. Everything that science currently suggests is accurate must also maintain the attribute of possibly being proven wrong, eventually. A resource-based society applies the scientific method to the fulfillment of individuals in a community. This is in fact already being done to a relative extent today. System's engineers do this world-wide by designing systems that bring relatively clean water, electricity, transportation, and communications to people's homes and community centers. They have been able to accomplish what they have accomplished because of the scientific method and a systems understanding of the architecture of the material environment.

The very purpose of science is to allow us to explain our own conditions. Hence, to some high degree our social organizations must be based on the very natural systems that "govern" us ... if anything could be said to "govern us". Humanity is regulated by nature whether some human individuals like it or not (or have a preference for it being so). The resource-based economy creates an economic information context where humanity can begin to "grow up" in its recognition of the larger information system within which it verifiably exists.

The advance of technology due to the progress of our sciences is not for us to fear, it is for us to consciously embrace and design love and compassion into, what could be more compassionate than technology that frees us from the wheel of fear and self-limitation, allowing us to spend our lives pursuing our passions and chasing curiosity? This system is not some imagined subservience to a machine collective; it's actually in all respects turning machines and AI into technical fulfillment facilitators for living beings.

A system based on resources is not an ideology; instead, it it an object accounting and measurement event away. It is an engineered system designed for a purpose. It appears as nothing more than an organized set of proven life supporting understandings, interrelationships and material infrastructures that inform the arrival at decisions that optimize human and environmental sustainability within a context of need fulfillment. It is the application of scientific and technical ingenuity toward the creation of an abundant resource environment. To claim that an engineered resource-based economy is an ideology is a fallacy of equivocation - an engineered system is not an ideology. An engineered system can encode an ideology, but it is not identifiable as an ideology. Ideologies are systems of unverified ideas (i.e., not science) and ideals (agendas and opinions) that form the basis of belief in a social or economic organization, including political theory and policy.

Nature isn't always compatible with our wants on an individual basis -- nature doesn't care about us as individuals; instead, nature appears to have an interest in the perpetuation of life, in general. Therein, if we understand how nature works and we work with those understandings, then we can enjoy a more optimal way of living than any of our ancestors.

> **INSIGHT:** *We must be open to challenge and thoughtful critiques of our system if we are to further the thoughtful development of our system.*

4.11 Utopia and the resource-based view

> **QUESTION:** *How much do we really gain in our societies by maintaining systems that in their design limit human reconnection, re-correction, or error-correction with the source from which we have all come in common.*

A resource-based societal operation is not the design for a utopia (Greek: not [u] + a place [topia], not-a-place). Each design iteration for the engineered processes that compose the present operational state of the society is simply the best design known of up until the present (i.e., when the design is being developed). If someone admits that an engineered system is capable of being updated when new information becomes available and also that humanity is capable of encoding the idea of error-corrective feedback into its socio-economic systems, then all talk of community being a conceptual place that cannot exist becomes erroneous and disingenuous. From a conceptual systems perspective, such a place is logically capable of existing. In fact, a resource-based society is designed to follow the community's emergent understanding of systems dynamics, so it is in fact the "best" system the community knows of or has developed to date. Early 21st century society has a "big" (potentially catastrophic) issue with error correction. It has [at least] set itself up with a whole host of applied technologies and systems with no accounting for their biological risks and behavioral affects (to its socio-psychology, to its health, and to its habitat). Early 21st century society is not a healthy system in a state of dynamic equilibrium with a functional mechanism for error-corrective feedback. Without error-corrective feedback intentional state change in a common environment is not only unlikely, but a potential scenario of conflict.

Society could be viewed as a protopian experiment in that, with each iteration and integrated learning, we-together continually evolve towards greater fulfillment, resilience, and sustainability. This process is inherently incremental and participatory, and encourages a common direction of striving for a better tomorrow. By embracing change and integration, and by valuing humanity and collaboration, society lays the groundwork for advancements that enhance the well-being of all its members/citizens. This forward momentum, driven by a shared vision of a positive today and positive tomorrow (rather than a perfect utopia or a continuing dystopia), fosters a flourishing environment where progress in human need fulfillment and real-world sustainability is not only possible but inevitable.

A society with a resource-based economy is not the "establishment of a final system", but rather the iterative emergence (i.e., "appearance") of a systems-of-systems, originating from those who compose its community, and not from any "rulers" or "administrators". In a resource-based economic system there are no market-State [political] rules; no power elite. Market-State politics tends to either maintain and keep things the same, or it becomes the toy of some smaller financial and/or military elite. The difference between market-State politics and community is the difference between "law-enforcement" with power-over-other ("political") relationships, and "standard-knowledge" with certainty ("statistical") relationships. The difference is the demand/incentive for power-over-others versus more understanding and better decision certainty.

To keep something the same is to state that there is no forward motion in any direction (e.g., lower / higher entropy) or toward any purpose (e.g., fulfillment / suffering). Community, and a resource accounted for decision system therein, is an emergent system. It is not a top-down system or a final established system, but a centrally distributed system (a systems-system) based on a shift in mindset of the population: that individuals can direct and orient their lives toward higher states of potential fulfillment; and to do this, they share and integrate information with a certainty value, and constructed and operated habitat-physical life locations (a.k.a., habitats/cities).

Life in a resource-based community does not become "less challenging" than life in early 21st century society. Instead, there is an experiential shift in the nature of stress and challenge, which become known as controlled hormetics. The challenge is no longer one of stressful and fearful survival, but one of opportunity for growth, flow and expansion. "Work", as in the laborious expenditure of energy for currency is not itself fulfilling. Its not intrinsically meaningful. It doesn't make people happy; access makes people happy. But "work", as in accomplishing an important goal, learning something, designing, building, growing, achieving, doing something that is in line with your values, is fulfilling and meaningful, and brings happiness. A community does not need a "superclass" that forces the challenge of daily survival on each of its chess pieces.

A resource-based economic community system is a system that emerges from [individual] participation within a commonly fulfilling [form of] organization, where contributors are users, and also, service users. There are no rulers; there are no bosses; and the authority is one's consent to live in community. Community emerges based on a shift in understanding of the individual over time through access to more accurate information (education) and more fulfilling organization [of human life and society].

4.12 Power and community

Community is a non-discriminatory, person independent (i.e., apolitical) system; it is not designed to create socially organized power structures, classes or hierarchies, that may curb its most efficient operation. It is a system without "factions" in decisioning (i.e., without politics, without opinion over engineering). It accounts for needs and preferences thus relieving the stress of having to compete for power over others. It is a form of organization which does not structurally reinforce the establishment of competing institutions. It is a system that doesn't give people who want to harm others a massive platform to do so. Instead, it is a participative system designed to accomplish economic fulfillment efficiently and without an administrative class of leaders, governors, or enforcers - it uses a set of participatively developed and formally understood [transparent] transport protocols [for decisioning]. In short, it is a system designed for non-hierarchical adaptive responses to individual needs and issues in common. Herein, one person is not choosing for another person. Instead, a decisioning method is designed and applied in common by all persons. It is a bias-agnostic system; a system to keep the community's communication clear and coherent - a value clarified space.

The tracking of information in a competitive environment (as in, predator vs. prey) is not equivalent to the shared transparency of trackable information in a cooperative social environment. Those who conduct the tracking (i.e., surveillance) in a competitive environment have a greater ability to manipulate and socially engineer due to the [incentivized] concealment and obfuscation of collected information. In a competitive [information] environment there is likely to exist a higher echelon (or "PRISM") of people who can use information in competitive warfare to remain in power.

In a resource-based economy, the integrity of the system partially lies in the openness of the total information system, which requires that individuals remain (or re-become) self-directed learners. Hence, it is "centralized" only to the extent that the community accounts for information from the whole of the real world. In an open information system there will always be information available to counter possible acts of destabilization. The odds of someone committing horrific acts against other human beings while living in a system of fulfillment would likely be extremely low. In community, there is no coercive force, there is only freedom in the effective and efficient fulfillment of needs. Such a society is set up so that there is no reason why anyone would want to act in a socially destructive manner (i.e., it is not a structurally incentivized behavior). Humans do not engage in violence and destruction without reason. Without a reason to harm society there is extremely little chance that anyone would do so. Community is essentially the emergence of a society of individuals who care for one another, applied that intention to into the encoding of their economic decisioning to form a "community".

> **INSIGHT:** *Community is participatively designed and built by a group of individuals to prevent the accumulation of power in the hands of a small group. Conversely, traditional [financial] economic systems are built to maintain such a system. Individuals need to be wary of any imposed order or government or institution or approach or understanding or thinking. Every imposed principle must be critically examined prior to conscious integration into an information system (e.g., mental model). An community is a collaborative and participative system; it is not an imposed system, but it is informed by the "imposed" technical regulations of nature as they are presently known.*

In a community, literally, every system is under the access-control or "governance" of the entire population in a distributed and participatively open-source manner. Note that something with the characteristic of "open source" is by its very nature distributed in form. When effectively designed for this functional purpose it prevents one person or group from taking control [of the whole distributed network of control]. The system is literally designed to be as resistant to absolute minority control as much as possible, and individuals are incentivized to maintain distributed [access] control.

> **NOTE:** *A community-type organization could be contrasted with a leadership-based "command and control" or "need to know" governance structure in which individuals are not aware of what the forces above them are doing.*

An 'openly distributed access-control system' is sometimes confusingly labelled as "governance". The application of the term "governance" is something of a misname here, for the word is most closely associated, in an etymological manner, with the following three concepts: authority; administration of rule; and socially controlling power. These three conceptual characteristics do not accurately describe the characterized makeup or behavioral characteristics of the Community's emergent socio-economic access system. When taken in their basic normative they are contradictory value conditions to those identified in the Community's social system. If there are socio-economic [access] rules, then those rules are universal and applied to everyone equally (i.e., distributed access). No entity can be given permission to break the rules, such as the "State". For instance, the State has the ability to force payment of tax on a relationship; this is something "you" as a "citizen" do not have the legally protected ability to do. If people still choose to call a community configuration of society, a form of "government" or "a governance system", then they must qualify their meaning of the term in order to be clearly understood. Community in its conceptual operation, as modelled, is not equivalent to the form of government seen by States or the governance structure seen in businesses and club[bed] organizations. In early 21st century society, although the term "government" may not be openly defined as such, government is in fact "a monopoly over the use of force and coercion within a given geographic area [administered by (land) owners]".

Government may also be defined in terms of "regulation", which the market always (or, has to) have. In community, the "regulation" is technically and formally defined to align with a particular direction (sustainable fulfillment) and value orientation (efficiency) with the real-world. The "regulation" in an real-world, resource-based society, is not coercive, it is societies best understanding of technical reality and society's ability to integrate that understanding into its technical[ly serviced] habitat [production systems].

All 'systems' are regulated through the controlling of processes. Adaptive systems observe the output of a controlled process and then adjust the process as required (or 'intended'). This is called a [control] feedback loop. There is another kind of control loop known as a feedforward loop wherein input variations are monitored, and then, the process is adjusted to compensate. System management involves regulating the input and process for the desired output. In living systems, "governance" structures and processes "evolve" to control the functioning of the system within its environment for its desired purpose(s), its survival and its fulfillment.

It should really be noted here that "governance" is sometimes mistaken for "guiding". It should not be so mistaken, "governance" is never about "guiding"; it is about 'controlling'. Any definition of governance that includes the word "guide" in place the word 'control' is using manipulative language. "Governance" is in fact the state of being governed, and "social governing" is the state of social control by an external social "governor". In some sense we might ask, "Do we want a participative, open control system based upon nature, or do we want a hierarchical social governing system?"

To redefine "governance" as "guidance" is a bit of a dangerous thing because it masks the socially governing power structure (or, belief in authority) behind the idea. For example, some alternative governance advocates define governance as "a sequence of activities carried out within a structure to achieve some set goal". A systems thinker would likely not refer to this conceptual idea as "governance" because of the varied social concepts already associated with the label "governance". Instead, a systems thinker would more likely refer to this idea as that of "systems control processes", which can be visualized for clearer communication. A recommendation engine, for instance, is a guidance system; it recommends access, whereas, a control system controls access. The question is, how do we want our access controlled; and, how do we process feedback? Do we want it distirbutively controlled and laterally powered (i.e., powered by individuals), or do we want it socially controlled and hierarchically powered? Do we want feedback from nature, or do we want feedback from the State and powerful for profit entities in the Market?

QUESTION: *Why should we spend hundreds if*

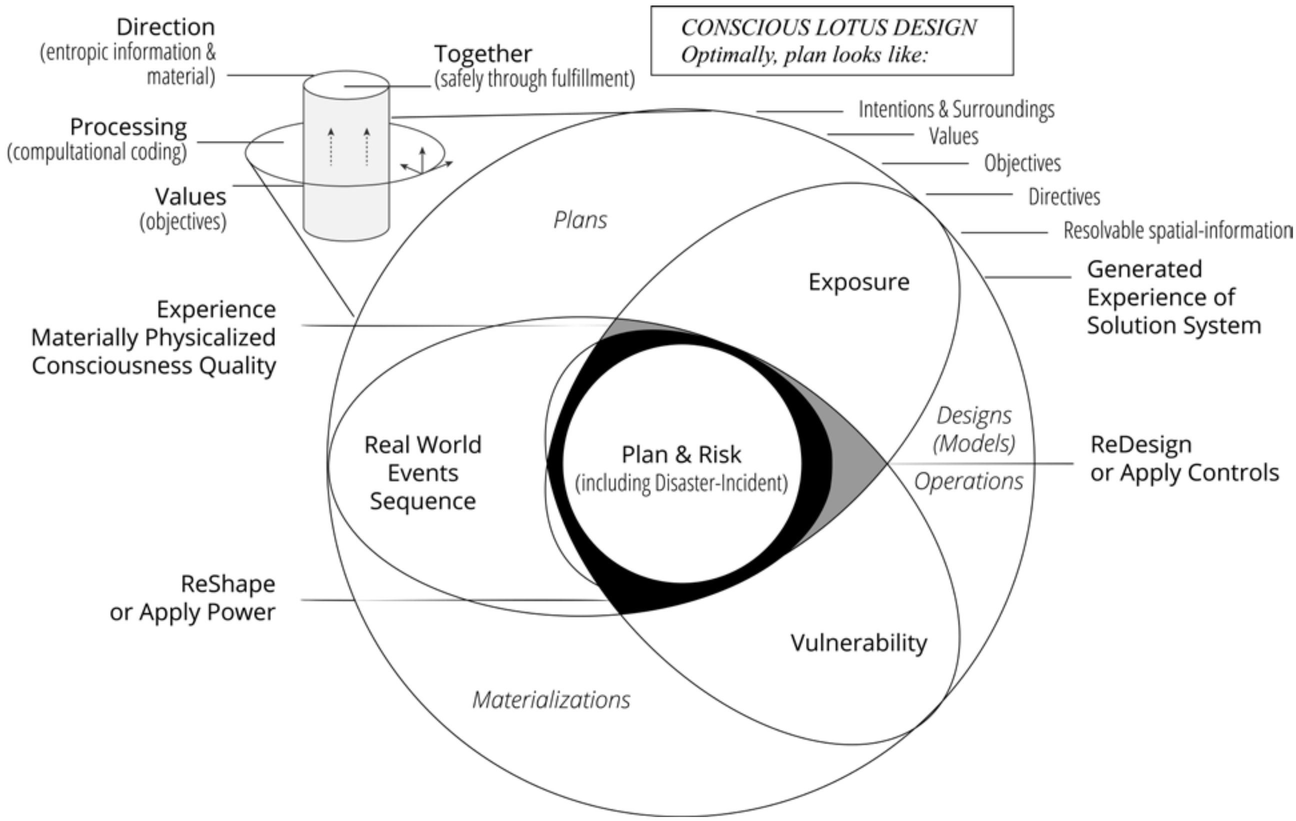

Figure 17. *A project coordinate where information is shared and resolved in order to sustain the continuous existence of an iterative societal system where all human individuals are mutually fulfilled. Together, humans may plan their informational and objective systems in order to generate greater states of well-being, fulfillment, and that which is desired. Life is reshaped through information and objective interaction. Life requires information and objective interaction.*

not thousands of hours deciding together what to do? Why not organize a system that gives the maximum amount of time to the individual to decide what s/he wants to do (i.e., greater freedom of choice)?

4.13 Planned obsolescence

NOTE: *In a more technologically advanced market economy 'planned obsolescence' is replaced with 'rent seeking' in order to maintain the cyclical consumption cycle.*

In a competitive structure for resource acquisition and engineering (apparently worthy of the title "economy") there is something known as "planned obsolescence" (i.e., built-in obsolescence). Planned obsolescence refers to the deliberate design and production of goods with a limited lifespan or functionality. Planned obsolescence is the deliberate planning of goods and services so that they are made to break down [sooner] to ensure their resale for the company in question. Similarly, 'intrinsic obsolescence' is when a good is made with inferior materials and inefficient production processes to cut corners on cost. Effectively, planned and intrinsic obsolescence are the conscious withdrawal/withholding of technical efficiency to generate repeat purchase, and they are common practices in the market. The aim of obsolescence planning is to encourage consumers to replace or upgrade their products more frequently, generating ongoing demand and sales. It is a strategy used by business to induce demand and maintain profitability.

Planned obsolescence is a value orientation away from comprehensive efficiency for the benefit of all and toward the planning of inefficiency for profit, exclusionary benefit, and to maintain the market cycle of 'cyclical consumption'. Businesses to varying degrees deliberately design and engineer products to wear out and malfunction [within a planned amount of time] in an effort to: repeat / maintain the continuity of sales, or maintain a cycle of continuous servicing (which becomes 'rent seeking'). Essentially, goods that could otherwise knowingly have a longer, safer, and more functionally useful lifespan are being given shorter lifespans (or lifespans that interrupt usage on a cycle) to maintain the money cycle (i.e., to continue commerce).

Planned obsolescence is an incentive in the market because its behavior facilitates cost efficiency for the owner: it is a form of self-maximization for profit. In the battle of competition everyone is looking for cost efficiency, and no one can make the "best" because everyone has to save money in some respect. Hence, there is "undercutting", one-upmanship, and competitive advantage as systemic practices in the market. In a sense, everything is obsolete the moment it is produced in a competitive market.

In the Community, we plan the lifespan of our goods and services, but we plan it for our functional fulfillment in an emergent manner. We realize that functional fulfillment is temporal, spatial, and iterative. In community, the lifespan of "products" are not planned for in terms of the deliberate continuation of an abstract [monetary] cycle.

Market philosophers sometimes argue that planned obsolescence is actually a good thing because they claim it drives "innovation" through the incentive to design increasingly powerful, efficient, and up-to-date products through the regular influx of money. In other words, they believe that planned obsolescence is making technology significantly better through continued profit.

However, to assume we [as society] need to keep money circulating in order drive technological progress is like saying running is good for your cardiovascular health, even if you are being chased by a lion who is going to eat you if you stop. Do you justify the lion chasing you as "good" just because it is forcing you to exercise? The lion symbolizes an inherently detriment force driving what is perceived of, in a truncated manner, as productive. The same logic applies to market economists who think that since "more poor people have cell phones, TVs and microwaves than they did years ago" it justifies the existence of the market system as a productive or even egalitarian force. And, it is conveniently ignored or not understood that the Market system (or more specifically the exploitation/scarcity/competition that underscores it) perpetuates poverty and class imbalance.

In fact, we could sit around all day making up things about progress and productivity within the confines of narrow, truncated frames of reference. "I hear cancer reduces your appetite! ... cancer must be great for losing those extra pounds. Wouldn't it be nice to have a free meal, free little room and a workout facility?... let's go to a prison and relax. I heard that the green revolution is going to be led by hybrid electric cars! I'm going to go out and buy 10 hybrid cars to support the cause! And perhaps the most amazing of all, coming back to your point, is the idea that buying things and pushing money around and incentivizing more industrial activity ("innovation") - even if it is unnecessarily wasting the earth's finite resources at the same time, speeding up ecological collapse - is actually a good thing.

As already stated, 'planned obsolescence' is the deliberate withholding of technical efficiency to generate repeat purchases. The by-product is, of course, more money to be applied to more possible products. But that is circular in its reasoning in the context of "innovation" as it assumes there is no other option available than to encourage waste. Does this also mean that "innovation" is about finding better ways to create better planned obsolescence? It is certainly something to consider.

5 A participatory-based economic [decisioning] model

A.k.a., A participatory-based model, a contribution-based model.

This decisioning model represents a collaborative social approach toward arriving at decisions to identified problems with human need fulfillment. Among community we seek a collaborative social approach to arriving at decisions to identified problems in fulfillment. This decision system is based on user contribution for user access. This economic model is a participatory model in that it involves multiple levels of volitional, voluntary and otherwise non-coercive, participation. There is participation throughout the models application, and without participating there would be no potential application of the model. In other words, the models application essentially relies on participation, because there is no coercion. It must be restated that all participation in the decision system is of a voluntary (and volitional) nature, and every individual in the community has the opportunity to participate. The economic model is designed based upon mutually beneficial and voluntary interrelationships (or "associations"). This design maintains an environment where we are more likely to work toward fulfilling our needs in common rather than seeking to get our own needs met at the expense of others. In a community-type society, there is autonomy of participation. Participation is both participation in demand identification and participation in contribution. Here, representation means a lack of direct choice. When "you" are being "represented", and therefore, do not have a direct choice, then don't expect quality. Additionally, the market does not have participation, it has coercion, because it trade (reciprocal exchange), and people must trade (or survive on others who trade). Instead of participation in production, markets have an employer, employee, consumer structure, where a few benefit greatly and most are coerced to trade their bodies for tokens that buy them access to markets where products are solid for profit. In community, the whole scientific community can contribute to the scientific review process (for information standards and for decisions), should they wish.

The two principles a participatory economy are:

1. **Contribution participation in the economy:** When interacting in teams, never engage in extrinsic rewards (tokens or punishment), and never engage in violence (separate from force). Do not contradict individual self-direction (do not coerce), and do not artificially inhibit another's growth, or the most problematic of all, spread mind viral beliefs of things that are not the real limitations of our life together.
2. **People participation in the society:** People doing home-economic-politicial (societal) activities [should] engage in information integration, strategic planning, and triage decisioning in order to provide for he habitat service needs (inclusive of global resources) of the current, and future, generations of users.

INSIGHT: *Participation enables further participation; contribution enables further contribution. Therein, what are we responsible for if not for ourselves and the society that we are continuously creating through our participation?*

It is relevant to note that there is a spectrum of possible states of participation in any societal environment, and these extend from volitional to voluntary to conditioned and eventually to coerced and forced. Some socio-economic systems force participation (e.g., governmental systems), and others do not. Some systems extrinsically condition participation (e.g., the market system), and others facilitate and guide intrinsic motivation. The restoration of intrinsic motivation as well as self-esteem facilitates socially intelligent decisioning (i.e., self-interest at the social level), which is likely to diminish the re-structured expression of the socially corrosive behaviors associated with that which is labelled as "secondary psychopathy" (or "sociopathy"). A useful economic system will allow for the emergence of voluntary participation with transparent systems. Only through voluntary association does there exist the capacity to contribute to globally effective action, where everyone has the opportunity to contribute to the community's knowledge base, its information systems, and its technical infrastructure.

An economic model is only as accurate as the community's conceptual framework and its empirical alignment with natural phenomena. When everyone has the potential to participate in the evolution of the community's total framework, then participation in the decisioning process takes on a whole new social meaning. Herein, everyone has the opportunity to contribute to the design and development of the models and systems that compose the community as well as the information infrastructure that informs all economic solutions. Equal participation means that everyone has an equal opportunity to participate in the economy. Participation is open to everyone. A community is a system of interaction where everyone decides through coordination and cooperation.

A participative sharing (i.e., participative-access) society minimizes its risks [to its needs] through efficiency in its relationships. A participative form of social arrangement was common with hunter-gatherer societies. And, humans have lived as hunter-gatherers in participative sharing arrangements for over 90% of their existence on Earth.

In community, team contribution is not fixed, but constantly revolving based on who wants to participate and who can contribute in any given role (task set). Arbitrary voting is replaced by the logical review of given concepts, objects, and measures based on scientific discoveries and systems engineering. Participation is open to everyone with sufficient qualification; wherein, all material issues are recognized as socio-technical problems involving human need fulfillment. The degree to which a person contributes is based on their education and ability to create and problem solve, as well as their own interest to contribute. This is why emergent and self-directed education is critical; for there to be intrinsic work (intrinsic motivation) there ought first be intrinsic education (self-directed learning, intrinsic motivation).

A functional community decisioning system is not governed by politicians or businesses, nor driven by popular opinion or exclusive agendas, but at its core it is upheld by the equal participation of individuals through an objective common process applied to human and environmental concern (or caretaking). All information applied to the decision system is openly shared and verified, which is exactly what other cooperatively social organisms do - they communicate for their own benefit.

When all "disciplines" are linked, then all interests can contribute. Contribution makes one feel more a part of the community. When all interests can contribute, then the interests of all are connecting and colliding.

In a participatory model the individuals in the community are both the "end users" as well as the "providers". The economic relationships between the two are transparently known and feedback is continuously present. The users have a vested interest, and are naturally connected "stakeholders" in the *design & manufacturing effort, characteristics and qualities, and conditions* of all items produced for and by the community. And, when users have the ability to participate in the design of those items and services that they use, then the efficiency by which users' needs are met becomes optimal[ly void of force, fear, and confusion].

When information is said to be "democratized" in this manner (i.e., equally available to all), then it becomes distributed to all and all can participate. With that said, the concepts of 'transparency' and of 'openness' are probably more accurate than the term "democratized", though.

Essentially, the contribution of effort and the contribution of multiple streams of information "run" the community. And, in the community anyone can contribute to this reservoir of possible experience. Everyone can contribute to the sustainment and the evolvement of our species in a habitat. But, we must first start openly communicating and caretaking.

A truly participatory-based model removes any penalty for not contributing and replaces the idea of penalty (or punishment) with a conceptual design that involves a freely contributory structural organization where we do what we do because we want to contribute to society and to ourselves in meaningful ways, and this fulfills ourselves and our community. A community is a socio-economic arrangement that facilitates free contribution.

A true participatory planning system requires the "democratization" of all knowledge and understanding so that it is transparently available to everyone and may be informed by anyone. Herein, all real problems are technical and all solutions are solvable by inputting all known relevant data, organized by causal reasoning and pattern recognition, and evaluated and tested by the scientific method, which is applied toward the engineering of new and more fulfilling structures. We, then, begin to realize that social involvement falls mostly in the realm of human need and our orientation toward our environment. If "democracy" is about finding consensus with values, then values are not orientationally aligned (i.e., "equal"). In the real world some values are more aligned with fulfillment, and hence, sustainable, and others have an increasingly diminishing relationship to the natural environment, and are therefore more likely to be unsustainable.

Values can be assessed and qualified: consider the affect they have on the process of human survival. As a basic example, if someone were to value profit at any cost, which leads to behaviors that pollute a local environment causing others to become sick, then that person's value is inherently unsustainable and causes suffering. The real revolution is the shifting of human values toward one of a higher potential [construction] of fulfillment. In community, we arrive at decisions via a formalized process that synthesizes solutions from scientific evidence using a referential [information] system that can calculate technical solutions to "issued" inputs.

Mass influence and propaganda are used by authorities to steer the masses in an entirely irrational way. The demands of human opinion will always be second to natural law if the common goal [of our species] is to survive. We can design a system where reality can be evaluated objectively.

Herein, we might find that if resources and economic outputs are not distributed in a manner that facilitates everyone's access, then the majority will be unable to participate in the system in any meaningful way.

In a truly participation-based system the condition of what is relevant is externalized (or "outsourced") to the community as a whole by asking the question, "what are your needs?" This type of inquiry should not be equated with the classic market mechanism wherein whomever pays the most [currency] gets their wants satisfied higher on the "priority list", which essentially maintains the formation (i.e., operational structure) of a power/class hierarchy. A truly participatory decision system is one of voluntary involvement and transparent participation. It is not a system of consultants feeding authorities information through decks of strategy and biased "research".

It is important to note here that the Community is not an entity of force or coercion, for there exists no such mechanism in the Community as a system. Some socio-economic systems maintain a mechanism that forces participation (e.g., competition in a market acts as such a mechanism).

When we share, our wants are neither “infinite” nor “perverted” [by advertising or marketing sciences]. What is the use of “marketing” if not the creation of demand and need for something “you” are going to sell [with the structural incentive for profit]. A community is a system that actually fosters self- and personal-development instead of mundane replication, conformity, and stagnation. To say that “human wants are infinite” is to de-contextualize human need from human desire and from nature, in general. A community involves the cooperation and social sharing of participation versus any form of market [object] exchange.

A lot of the “desires” that we have that are claimed to be “difficult to quantify” come from artificial sources of conditioning. Advertising is "price paid" sponsored speech to influence minds and society in profitable ways. Advertising, publicizing, marketing, and otherwise “commercializing” inherently involves the engineering of desire and of behavior. It is a targeted psychological attack on someone to give them a desire for “your” product. There has been a multi-generational trend of condition the social populace toward consumerism, through advertising and propaganda (or “public relations”). Advertising is brainwashing; potentially undesirable incentive seeding. And, individuals protect themselves from this type of conditioning through a set of thinking tools including systems [science] thinking, critical thinking, and analytical thinking. These structurally useful ways of thinking may become encoded into our ‘critical factor’ to allow us to pattern-resonate with a higher fulfillment more frequently. There are actual priorities and conditions when it comes to surviving and flourishing that advertising obfuscates.

One of the primary purposes of the advertising and marketing industry is the engineering of demand. The contrived engineering of demand is such a significant issue [for individuals enculturated into a society that accepts it as normal] that it is discussed in the Social System, the Decision System, and also, the Lifestyle System. Through these readings one might come to an understanding that wants would be a little less chaotic among community.

The research done by the economist Manfred Max-Neef, and many others, refute the claim that individuals have unlimited wants. Those who believe that human wants are infinite make the claim that it is human nature to want an endless number of things in any given moment, yet have a limited amount of resources to achieve those wants. Max-Neef states that this claim was made hundreds of years ago when humankind’s understanding of human behavior was more primitive. Research into the nature of the human condition has discovered that a spectrum of human needs are an inherent part of human development.

Fundamentally, there is a difference between human needs and inculcated [cultural and market] expectations. Herein, the development of ‘intuition’ involves the realization that there exists a difference between needs, wants and preferences. A very simple example of this might be the following scenario: A waiter comes to table and asks a child, “What do you want?” The parent at the table then asks the child, “What do you want?” Notice that the child is not being asked, “What does your body need?” Early 21st century society designs experiences (and products) for profit, not for fulfillment [at a structurally fundamental level]. There are, in fact, artificially concocted wants -- wants that you only want because someone else wanted you to want them. It is important to recognize that the only reason some goods and services exist at all in early 21st century society is because they can monetized.

Only a truly participatory model will allow an observation of the emergent behavior of the whole system, without being controlled by either a single heroic “leader” or even a subsection of the collective group. ‘Emergent behavior’ refers to the collective phenomena or set of behaviors in complex systems that do not exist in their individual parts, but upon their relationships to one another. Thus, emergent behavior cannot be observed or predicted by examination of a system’s individual parts. It can only be understood through the parts and their relationships. ‘Emergent’ behavior is also known as ‘emergence’, a unit of which is an ‘emergent property’, which exists in reference to “the whole is greater [in meaning] than the sum of the parts.”

In a real world socio-economic model individuals would not have to ask permission (e.g., apply for licenses) to behave in normal ways like they do in a property-based system, where individuals must constantly ask, “May I do this?” Instead, this community system is open for anyone to create and innovate and share and explore if they want to, by themselves or with others. Property is one mechanism of coordination, but it is not the only one. A common access-/resource-based system is an alternative.

If the community is an information system, then the ‘habitat service systems’ are information platforms developed for the organized fulfillment of our needs, and within which we create and learn and participate.

Economic activity within a community’s decision space is founded upon ‘intrinsic motivation’ rather than the extrinsic motivators of the modern economic system. Intrinsic motivation refers to being involved in an activity or project because “you” want to be involved, which requires a particular form of environmental orientation involving the value dynamics of autonomy, mastery and purpose. ‘Autonomy’ refers to the ability to choose what you are working on, where, when, how, and with whom. ‘Mastery’ refers to doing tasks that are challenging, but not far beyond your abilities, leading you to constant improvement, which is a rewarding factor in itself. ‘Purpose’ refers to doing “your” work for what “you” perceive as a good reason – perhaps the desire to achieve something in particular. If “you” are someone who is doing “your” current job purely for money and would probably quit if you won the lottery, then you are not intrinsically motivated. Intrinsic motivation is a far more worthwhile than money. In a figurative way, it is the structured essence of our will-power. It lasts longer than extrinsic motivation (which self-degrades over time); it is self-renewable; and, it allows for far deeper explorative creativity.

In a horizontal socio-economic system without the integrated application of the scientific method to social concern there is still the risky uncertainty of individual's personalities replacing verifiable evidence to the contrary.

> **QUESTION:** *Are we creating together or are we just participating in someone else's creation?*

6 A market-State ownership and trade economic [decisioning] model (in contrast to community)

In contrast to decisioning in community, a market-State type societal model has an ownership and trade foundation for resolving economic fulfillment, which it accomplishes at the cost of crises and inefficiencies.

> *"What would be the result in heaven itself if those who get there first instituted private property in the surface of heaven, and parcelled it out in absolute ownership among themselves, as we parcel out the surface of the Earth?"*
> *- Henry George*

The market is composed of subjects, subjects trading objects, and mediators of the trade of objects (i.e., finance). The only intentions in the market are those which come from the subjects. Instead of possessing ownership of objects and requiring their trade in order to survive and thrive, it is possible for the subjects to coordinate access to objects through global cooperation, the mediator of which is a societal information system and associated habitat service team. Our feelings about ownership have very deep roots. Most mammalian life forms have a sense of territory – a place to be at home, protected, and to defend. Indeed, this "territoriality" seems to be associated with the oldest (reptilian) part the brain and forms a biological basis for our sense of property. It is closely associated with our sense of safety and our instinctual "fight or flight" responses, all of which gives a powerful emotional dimension to our experience of what early 21st century society refers to as "ownership". Yet, this possible biological connection does not determine the form that territoriality takes in different cultures.

One behavioral aspect of living beings, mammals in particular, is a desire to control a territory for the most basic of needs, those of food and shelter. Therein, it is important to ask ourselves: have we as human beings not socially evolved beyond such basic reflexive behavior when we come together socially? Though territoriality may be a part of our total "nature", surely we can create social environments that don't signal, incentivize, and re-engage its emergence [to everyone's detriment]. It is important for us as socially conscious beings to realize that territorial disputes generate hostility and warfare, and that it is possible to re-design our social and economic structures to generate abundance throughout a society while reducing the likelihood of territorial conflicts. Also of note, in early 21st century society, the aberrant hoarding of resources [often to one's own and others detriment] is an aspect of territoriality behavior, which can be overcome through a structural re-design of the total system.

When discussing territoriality and the human species, it is important to note what the anthropological literature. The research shows that population density was an important ancestral condition. Today we also know that an ecological system contains a carrying capacity. Although it is absolutely necessary to account for carrying capacity if a community desires to survive, it would be wise to also account for population density in the city-system design if a community desires a reduction in territoriality-associated issues of conflict.

Humans, like many of our primate cousins, engage in group (as well as individual) territoriality. Tribal groups have traditionally seen themselves as connected to particular territories – a place that was "theirs." Yet, their attitude towards the land was very different from those of people in early 21st century society. They frequently spoke of the land as "their parent" or as "a sacred being", on whom they were dependent and to whom they owed loyalty and service (i.e., caretaking). Among the aborigines of Australia, individuals would inherit a special relationship to sacred places, and rather than "ownership," this relationship was more like being owned by the land. This sense of responsibility extended to ancestors and future generations as well. The Ashanti of Ghana say, "Land belongs to a vast family of whom many are dead, a few are living and a countless host are still unborn.

For most of these tribal societies, their sense of "land ownership" involved only the right to use and to exclude people of other tribes, but usually, not members of their own. If there were any private land rights, these were often subject to review by the group and would cease if the land was no longer being used. Generally, the sale of land was either not a possibility or not permitted. As for inheritance, every person had use rights simply by membership in the group, so a growing child would not have to wait until some other individual died or pay a fee to gain full access to the land.

In early agricultural societies farming made the human relationship to the land more concentrated. Tilling the land required permanent settlement and "a mixing of one's labor with the land", which meant a greater direct investment in a particular place. Yet, this did not lead immediately to early 21st century society's ideas of land ownership. As best as is known, early farming communities continued to experience an intimate (possibly "spiritual") connection to the land, and they often held land in common under the control of a village council or group of "elders".

It was not so much farming directly, but the growth of population density from agriculture that led to major changes in perspective toward the land. Therein, many of the first civilizations were centered around a supposedly godlike king, and it appears a natural extension to go from the tribal idea that "the land belongs to the gods" to the idea that all of the kingdom belongs to the "god-king". Privileges of use and control of various types were distributed to the ruling elite on the basis of custom and politics and other growing power dynamics." Herein, common heritage began to be appropriated for private use.

As time went on, land took on a new meaning for these ruling elites. It became an abstraction, a source of power and wealth, a tool for other purposes. Those with power began to perceive land as something to conquer, to hold, and from which to extract the maximum in tribute. Just as The Parable Of The Tribes would suggest, the human-human struggle for power [in a state of social and economic competition] gradually came to be the dominant factor shaping the human relationship to the land. (Schmookler, 1984) This shift from seeing the land as a sacred mother to merely a commodity required a deep social re-orientation.

Hence, the idea of private land ownership developed partly as a guard against the loss of one's power establishment and partly in response to the dissolution of cooperation and burgeoning economic opportunities presented by a growing labor-consumer population. To guard their power, the nobility frequently pushed for greater legal/customary recognition of their land rights. In the less centralized societies and in the occasional democracies and republics of this period, private ownership also developed in response to the breakdown of village cohesiveness and community cooperation. In either case, private property permitted the individual to be a "little king" of his/her own lands, imitating and competing against the claims of the state.

Throughout the whole history of what is known as "civilization" land has been seen as primarily a source (or "the source") of power, and the whole debate around ownership has been, "To what extent will the state allow the individual to build a personal power base through ownership rights to a territory of land?"

> **INSIGHT:** *Wealth in a network is not managed by exclusion, nor restriction and profiting, but by openness, availability, and collaboration – by how available the network is to most people rather than by how unavailable it is to some people. In cases where both competitors have rights, such as when a factory pollutes a neighbourhood, the general sentiment of the political market is that the rights have to be balanced, and the more important right (depending upon the circumstances) should prevail; therein, the State will step in and facilitate the "balancing" on behalf of the rights holders.*

The individual[istic] gathering and storage of resources in private and under conditions of economic competition leads to relationships based on power-over-others, and is naturally a dangerous social situation. Ownership of what would otherwise be common allows for trade. Trade allows for accumulation. Whereupon, ownership separations and disputes hinder the ability to plan [as a community].

In the market-State, that which is own able is:

1. The self (self-ownership).

2. Land.
   A. State territory ("public") ownership.
   B. Land (commodity) ownership.
3. Biological and mineral resources.
   A. Acquirable resource (commodity) ownership.
4. The means of production.
   A. Production (means) ownership.
5. The products of production.
   A. Produced (commodity) ownership.
6. Information.
   A. Information (commodity) ownership.

6.1 Trade

A.k.a., Exchange, transaction, market, capitalism.

That which is tradeable is property, and property is that which is owned. Trade is a societal-level operationalization of access in the form decisions inclusive of the value of competition and/or scarcity, which sets up market-based patterns of relationship in society. All decisions to trade come from influences and pressures. All trades include property. Some trades include authority (to ensure the trade is "fair" and agreed to). In the early 21st century, everyone must participate in trade, or survival is not possible (i.e., either trade or you don't survive). Additionally, in society, scarcity in fulfillment and the adoption of competition as a value leads to trade [among the population of society]. Alternatively, when everyone has access to everything they need and prefer (want), then people in society do not need to trade anymore. There is no trade in community, because it is a self-sufficient economy based in cooperation (and not, competition). Trade is the competitive transactional transfer of humans (labor), objects, services, and abstractions, between market-State entities. In a market, humans do labor (labor circulation), objects circulate (product circulation), and abstract currency circulates (currency circulation). Trade involves the holding (as legally defensible property) and exchanging of resources and abstractions (e.g., money). Every trade is a market or market-State (meaning that it also includes the State) transaction. It is relevant to note here for classification purposes that money is a sub-conception of trade, and trade is a sub-conception of property ownership, which is associated with perceptions of competition and of scarcity. These conceptions all represent methods for the organization of a society. And, all conceptions associated with trade are a problem for global human fulfillment. The idea that all acts of trade a voluntary and not coercive is untrue, because market motivation is based in extrinsic motivation and pressures for people to trade in order to survive.

> **NOTE:** *It could be said that abundance in access to human need fulfillment is part of the solution to the challenges facing early 21st century society. However, this association with abundance can only be taken so far, because it is also possible for abundance to come from trade. Trade can quite obviously produce an abundance of what is needed and not needed. Community (cooperation) optimizes the production [of abundance] for what is needed. However, in the market, trade is required for abundance, and people are forced into trade. People are forced to give away their freedom [of intrinsic motivation] for accessing habitat services (e.g., roads, water, food, etc.). It is a trade-off; the market is a place of forced trade. Fundamentally, trade is a behavior that humans in the market are forced into in order to survive.*

Trade is a market-based event, a market transaction. In this sense, trade is a basic market-based economic concept involving the selling and buying of goods and services, with compensation paid by a buyer to a seller, or the exchange of goods or services between parties. Trade is an economic method/behavior that allows for sellers to profit and buyers to have access under a state of competition. Trade can take place within a market economy between producers and consumers (as well as between producers themselves.

Trade is a market-based event that has serious consequences for State events. The concentration of wealth through trade can create politically unfair and harmful environments that serve the interests of a few over everyone's common human needs. In the market state, voting may be influenced by money. There is a common saying in market-State political balloting, "You vote with your money". In this type of environment, those people with the greatest money wealth have the greatest potential voting power. In other words, when money influences voting, then the individual(s) with the greatest monetary wealth, and/or expense of wealth, are likely to have the greatest voting power. These people, because of their wealth, are more likely to have their decision selection taken over the selection of others. They may even be capable of forming decision spaces that favor themselves over others, that would not otherwise even have formed. Fundamentally, an imbalance (as well as, definition) of wealth among the population of will lead to an imbalance in fulfillment and in social power.

Under the condition of trade, humans have invented many of forms of currency [as a universally agreed medium of exchange] to optimize trade as well as reduce insecurity in trade. Historical examples of money include, but are not limited to: salt, paper money, debt, digital money).

Trade can be harmful to human as well as ecological relationships. Anyone in a position to profit more from one transaction is likely to profit more from future transaction. It is possible to prove mathematically that all trade, regardless of what it is or how it is engaged with, creates inequality. Inequality statistically follows from trade. (Boghosian, 2019; Devitt-Lee, 2018) Profit and advantage over others (under a state of competition) has many harmful affects, including changing how people behave toward one another for the worse.

Mathematically speaking (and hence, logically speaking), trade [over time] creates an imbalance of power and access between people. This imbalance of power and access incentivizes people to lie, exaggerate claims, bribe (lobby), create poor quality goods and services, falsely manufacture demand, etc. In this way, trade is a force that pushes people to behave badly. Many people in the early 21st century are not aware of how the requirement to engage in trade causes social and technical problems with their optimal global fulfillment.

The results of most trades are profit by one entity (in the trade) over the other. Versus community where there is not trade, and hence, where resources are used for subsistence and flourishing, not to trade for a profit.

Trade condenses wealth, assets, and power. Any trading advantage (or disadvantage) gets compounded over time, creating a class structure. If someone trades well, chances are higher that they will do better next time too. If someone trades badly, they will probably do worse next time, etc. Hence, trade creates a concentration of power over time, and historically, there have been many different entities with such a concentration of power, including entities in the market, the State, and the public domains. Some of these entities come and go, and others remain for long durations of time. The concentrations of power are in some relative degree of competition with one another.

Simplistically, there are two input rules of society from which power concentrations emerge:

1. Trade.
2. Take what you can.
3. ... repeat.

Conversely, the following "rules" are operative in community:

1. Sharing skills and resources.
2. Consume responsibly.
3. ... repeat.

Community is a trade-free system. In community, production is directly social, carried out by the community, rather than by private traders (i.e., social production rather than private profit). Fundamentally, a more equal access (Read: equitable) society is mathematically possible when trade is removed and replaced with global economic calculation.

There are essentially two types of trade possible in the market, both of which relate to access:

1. Trade for access:
    - A. **Trade for access to production** (capitalists/employers).
        1. Capitalists - capitalists buy in order to sell.
            - i. Pay employees (purchase humans) - capitalists buy workers' bodies with wages (credits).
            - ii. Pay other capitalists (purchase equipment) - capitalists buy equipment from other capitalists to produce.
    - B. **Trade for access to habitat services** (consumers/employees).
        1. Employees - sell their bodies for credits ("wages").
        2. Consumers - purchase life necessities with credits ("wages").

The market-State (capitalism) is significantly based in trade. Capitalism production and citizenship involves the following types of transactions:

1. **The trade of objects [as commodities]** - sellable production products. In a sense, human labor is also a sellable object. Humans are also a commodity, the employee works for money as a trade with an employer.
2. **The trade of abstractions [a money, currency, or finance)** - abstract "financial" resources are trusted by consumers who trade them for the commodities, and employers trade them for productive work.
3. **Capital execution** - putting to work the physical and financial resources/assets used by the employer to produce commodities using machine and human labor.
4. **Citizenship transactions (State transactions)** - people move to and contract with different State jurisdictions to receive the socio-economic benefits of that State jurisdiction. Contracts for citizenship and other interface points are transactions with the State, wherein the State provides a service and someone is forcefully taxed to pay for it.
5. **Social credit transactions** - take a specific action designated as appropriate by the State or social environment and receive an amount of abstract numerical credits. Or, take an action designated as inappropriate by the State or social environment and have an abstract numerical amount of credits deducted.

INSIGHT: *In the early 21st century, it is not possible to have trade without trust [in money]. This link puts the early 21st century in a precarious position -- if the trust in money disappears, then access to all goods and services will disappear. If another parallel or prototype system is not in operation, and the public's trust in money disappears, then societal life support (e.g., food, water, etc.) could disappear entirely.*

Both the "free" market and the market with government control are obsolete, regardless of what exists in the early 21st century and regardless of theory.

The market where people, objects, and abstractions are exchanged for production and access is obsolete, because there is sufficient knowledge and technology available to humans in the early 21st century do not have to exchange (trade) to provide everyone a high level of fulfillment. Those who desire to talk about "freeing the market" ought to go one step further and talk about freeing humanity from the whole scarcity- and competition-based paradigm. Further, those who talk about "socializing the State" ought to go one step further and visualize societal operation without power-over-others (authority). There is scarcity in nature, but there is artificial scarcity imposed on the early 21st century population by the market-State system. In the material world, there are real physical barriers, like someone growing something in a far off place (where, distance is the physical barrier). It is technically possible to ship objects, but that is not the artificial scarcity being referred to here; that is a physical barrier. For example, wool may be grown in a place called England and wine in Portugal - one population may be good at growing one object and another population at growing another, and they trade for mutual advantage. The market mentality claims that trade is good because it brings abundance (access). Because it brings wine from Portugal to England, which England otherwise wouldn't get because England wouldn't be able to grow the grapes to have the wine, and it brings better or cheaper or higher quality wool from England to Portugal in exchange for the wine, and whether it is using the medium of money is not particularly important. The claim is that more abundance and variety flows into both locations. Under conditions of competition and scarcity, where one population separate from another has exclusive access, and a low-level of technology, trade provides better access. But, in community, there are not competing entities with exclusive access to special geographic locations. And, an objective assessment of technology and knowledge availability realizes that exchange is no longer necessary and does in fact carry a set of consequences that are harmful to humanity. In community, there is no such thing as "Portugal" or "England". In the early 21st century, even if you were in "Portugal", you only have access to "Portugal" wine when you buy it, unless you grow it yourself. This is a microcosm example. The market is one way of "managing scarcity" for socio-economic access to products and services. The whole notion of exchange itself is an obstacle to human fulfillment given what is known and the technology available in the early 21st century.

> **INSIGHT:** *If I don't have something to give you, and you have something that I need, then I can't get this thing from you, because I don't have what you want.*

6.2 Ownership and property

> **INSIGHT:** *If there is a market for something, then no amount of force can stop it. And, the one fundamental thing there will always be a market for is, community.*

Ownership is the principle foundation upon which [market] economics and all laws are based. People in early 21st century society like to discuss the idea of “ownership” as if it were an obvious and explicit concept: either you own (or “control”) something or you don’t. For most people (throughout history) this has been a useful, though possibly unfortunate, approximation. However, when seeking the design of a socio-economic system oriented toward human well-being and in alignment with nature, then such a simplistic definition is not as workable.

> **CLARIFICATION:** *Ownership is really just control. The question to ask is, Who controls the system and its resources?*

“Ownership” refers to someone or some entity (e.g., a business) being the “legal[ized]” owner of an item of “property”. Note that the idea of “property” accompanies every notion of ownership and is essentially a concurrent (or sub-) conceptualization of the idea of “ownership” – something can be owned by someone, and therefore, it becomes (or is) their property. In other words, “ownership” refers to some form of legal relationship between an “owner” and their item of “property”. Stated in even another way: ownership refers to a legally relationship between an entity in the market and a tangible (or intangible) item known as [their] property, which is protected by an [legalizing] enforcement mechanism generally known as a State. Essentially, property is a symbol of a protected and enforceable, exclusive relationship known as “ownership”.

The process and mechanics of ownership are fairly complex and they change depending upon cultural norms and jurisdictional law. In most modern societies someone becomes the legal owner of an item of property:

1. By trading or otherwise paying money for it
2. By inheriting it
3. By having it gifted by the previous legal (or legitimate) owner.
4. By finding / discovering it (qualified by jurisdictional law, if it was found in a jurisdiction; “discovery doctrine”).

Historically, and still to this day in some areas, someone may become a legal owner by mixing their labor with the land (the land becomes their property), producing a child (the child becomes property), or by slaughtering the people who were previously occupying the land and occupying it themselves (again, the land becomes theirs). Also, most States have the legal authority to take private property for “public use” (which may then be sold to a business). Governments argue that without this legal ability to confiscate property there would be no road network, for example. The name given to this property acquisition law varies depending on the government in question. Some common names for it include: eminent domain; compulsory purchase; resumption; compulsory acquisition; and expropriation.

In legal terms, ownership is considered a set of rights (as in, "legally right relationships"), powers, and possibly, duties or obligations over some form of property. And, determining ownership in law involves determining who has these rights and duties over the property. In other words, "ownership" represents a set of legal rights (or entitlements) that can be held by some entity (or entities) with respect to some item of property. These "property rights" are said to govern both the owner's relationship(s) to the item of property as well as all non-owners in their relationship to the item of property as well (which in early 21st century society is enforced by a State of violence). Property rights are a legal claim, which is capable of being owned and transferred. Herein, the idea of "property assignment" refers to the transfer of one owner's rights over an item of property to another owner, and it is most often applied when speaking of "intellectual property".

In early 21st century society, these "property rights" or "ownership rights" usually include the right to (i.e., decisional authority to):

1. Use (or not use).
2. Exclude others from using.
3. Irreversibly change.
4. Allow to deteriorate and waste.
5. Sell, give away, or bequeath (i.e., transfer).
6. Rent or lease and contract.
7. Retain all rights not specifically granted to others.
8. Retain these rights without time limit or review.

So, if you own something you have the right to destroy it, though in doing so it could (a) harm others (because we are all connected and pollution travels) or not recycle or give it to another in need just because you don't want another to gain some competitive benefit from you not destroying it.

When the jurisdiction of a government is involved (as it nearly always is in early 21st century society) these "lawful rights" are generally not absolute; they are further governed by other laws dictating usage and modification (for example) of the property. In more euphemistic terms one might say that with "property rights" and under the jurisdiction of a State there also come "responsibilities" or "duties", such as paying taxes, being liable for suits brought against the property [owner], and abiding by the other laws of the jurisdictional state. Many rights to property under the jurisdiction of most States are limited. For example, zoning laws, building codes, and environmental protection laws reduce a citizen's right to use, irreversibly change, and waste items of property. Nevertheless, depending upon the jurisdiction, it could also very easily be said that within a wide range "you" are the monarch over "your" property [because you are its legal owner].

Each of these rights (or "legalized right relationships") can be modified independent of the others, either by law or by the granting of an easement to some other party, producing a bewildering variety of legal conditions.

The ability to directly own land is dependent upon the legal situation in a particular State jurisdiction. Most modern State jurisdictions claim that "no one, or no single party, directly owns (i.e., has complete claim to) the land itself", an entity can only own "rights" to the land – a highly transposable argument (i.e., simply transposing the concept of "ownership" for the concept of "rights", which the concept of "ownership" already encompasses in the context. Generally, however, "you" can't even own all the rights since the State [nearly] always retains the right of confiscation. Hence, it could be said (depending upon perspective) that the State directly owns the land since it can tax, confiscate, and re-write the relationships [as it sees legally fit].

In part, "you" have property because there are social rules granting "you" property of something and granting either "you" or someone other entity the rights to defend it. And, these are quite possibly rules that "you" never had a say in and that can be modified by those with greater social power and influence. States are founded on the monopolistic/imperialistic control of land. Rent is paid to the State in the form of tax for land-property, as well as market-State transactions thereon. Therein, governments are founded, in part, on what they say they will do in concern to their monopoly over land (a.k.a., territory). In general, the State is a 2nd party holder in most property and most people have to rely (or otherwise depend) on it in order to defend their property [from competitors in the state of a market]. Because the State is tantamount to a 2nd property owner in nearly all property (if not all property within its claimed and perceived jurisdiction), then the question quickly arises, "What will the State as a 2nd party holder allow you to do and not allow you to do with and also in "your" property?"

6.3 What is property?

> **INSIGHT:** *Imagine how hard it would be to abstract out or isolate out something and turn it into a commodity and view it as a thing (a noun) when your language references it as a process (a verb). Language can actually make it difficult to possess a thing.*

Property is an invention by man; there is no objective platonic definition of what property is. It is a human construct established by legal terms and an enforcement mechanism. In legal terms, property becomes a collection of rights. And through its encoding a hierarchical tyranny becomes socially and economically incentivized. With property there comes hierarchy, and the incentive to monopolize. To some extent, this can be intuitively understood by looking at the nature of tyranny. Tyranny is an intent of monopoly. Therein, tyrannies cannot co-exist with free processes or transparent organization (when confronted with their baleful influence, the tyranny must censor, control or destroy them). Property is an exclusionary and competition-based process; it is not a sharing-oriented system. No monopoly can exist and survive without the assumption of property which gives it an exclusive "right" to defense [of property, which can be monopolised].

Under the law, in general, ownership is not equivalent to the idea of 'possession'. Possession means using, storing, or having access to an item. Elsewhere in early 21st century society, ownership and possession are synonymous.

6.3.1 Title

Ownership of something (land in particular) is conveyed through something known as "title". "Title" is some kind of legal proof of ownership of the property; often a piece of paper with a State approved legal representative's symbol/signatory present.

6.4 What is land?

> **NOTE:** *Land ownership is strange: Two people walk onto a piece of land: the first claims ownership and the second owes rent. And, there may have even been human beings there before.*

Land is both a resource and a living entity, with potentials that can be permanently destroyed by a thoughtless or selfish owner. The very concept of ownership encourages such misuse, and has limitations which ignore ecological requirements and the larger common human interest. Generally, the market philosophy refers to this true lifegrounded nature of land as an "externality", which is true; it is external to the nature of the market [mindset].

In general, the human usage of land will deny that land to the animals that would otherwise have lived, and eaten and thrived there.

> **INSIGHT:** *Money is the conversion of nature into property for exchange.*

6.5 Property and movement over land

In early 21st century society, the property system creates a static orientation toward land access, with people typically acquiring land and staying on it indefinitely, eventually bequeathing to their relatives who in turn do the same until it is eventually sold or taken from the family when they can no longer pay their rent (or "tax") to what appears as the ultimate land owner, the State.

This tendency to "settle" seems compounded by the labor roles and location requirements (e.g., nationality) of most people in the world. The tradition of commuting to one's permanent job is still very common, and hence, one's home needs to be within a reasonable commuting (most often driving) distance. In the community (multi-city) described herein, such pressures are greatly alleviated and the idea of traveling the world constantly is a tangible option, though not necessarily one that will be selected by everyone, or even, most people. It simply represents an increase in the freedom of choice and a hearkening back to our ancestral (hunting and gathering) lives when we re-located more regularly.

That noted, the method of access for the Community involves the persistence of an interactive sharing system, including a residential sharing interface and backend system, which includes a network of different genres of domicile. There is no reason why a "permanent" location for a person or family cannot exist. In fact, there will likely be a large percentage of people and families who choose freely to live this way. The choice is each individuals, either way.

6.6 Mixing labour and property creation

> **APHORISM:** *Our lives are profoundly shaped by the rents we have to pay.*

Some capitalist philosophers hold the belief that property arises out of mixing one's labor with the land or some other natural resource. This is also known as "homesteading". If someone works the land then that person has a "right" to own the land, the land becomes their property. The claim is that when someone invests their labor in the land or in natural resources, then they acquire some right of ownership. There are several issues and questions that must be addressed here. The following points are just some brief comments and the remainder of the ownership, property and rights section will need to be read for a more complete understanding of the underlying insights of these comments and question.

First, the question of origin must be addressed. From whom does a laborer acquire the right to property ownership after they have invested their labor in land or natural resource? Second, what does it actually mean to claim that one is "mixing their labor with land?" How specifically does the "mixing" [magically] turn a resource into property?

This formulation comes to us from John Locke (1689):

> *Though the Earth, and all inferior creatures, be common to all men, yet every man has a property in his own person: this no body has any right to but himself. The labour of his body, and the work of his hands, we may say, are properly his. Whatsoever then he removes out of the state that nature hath provided, and left it in, he hath mixed his labour with, and joined to it something that is his own, and thereby makes it his property. It being by him removed from the common state nature hath placed it in, it hath by this labour something annexed to it, that excludes the common right of other men: for this labour being the unquestionable property of the labourer, no man but he can have a right to what that is once joined to, at least where there is enough, and as good, left in common for*

others.

Note here that Locke's assumption that "every man has a property to his own person" represents the notion of self-ownership, which is addressed elsewhere here.

How is the "mixing" of one's labor a sufficient condition for turning a resource into property, from something small and consumed such as an apple to an entire piece of land; John Lock states:

> *As much land as a man tills, plants, improves, cultivates, and can use the product of, so much is his property. He by his labour does, as it were, inclose it from the common.*

Locke believed that the proviso ensured that no one would be deprived because there has to still be "enough and as good" for everyone else. But even that is beside the point. The point here is, what is this magical transmutation that turns a piece of land into property?

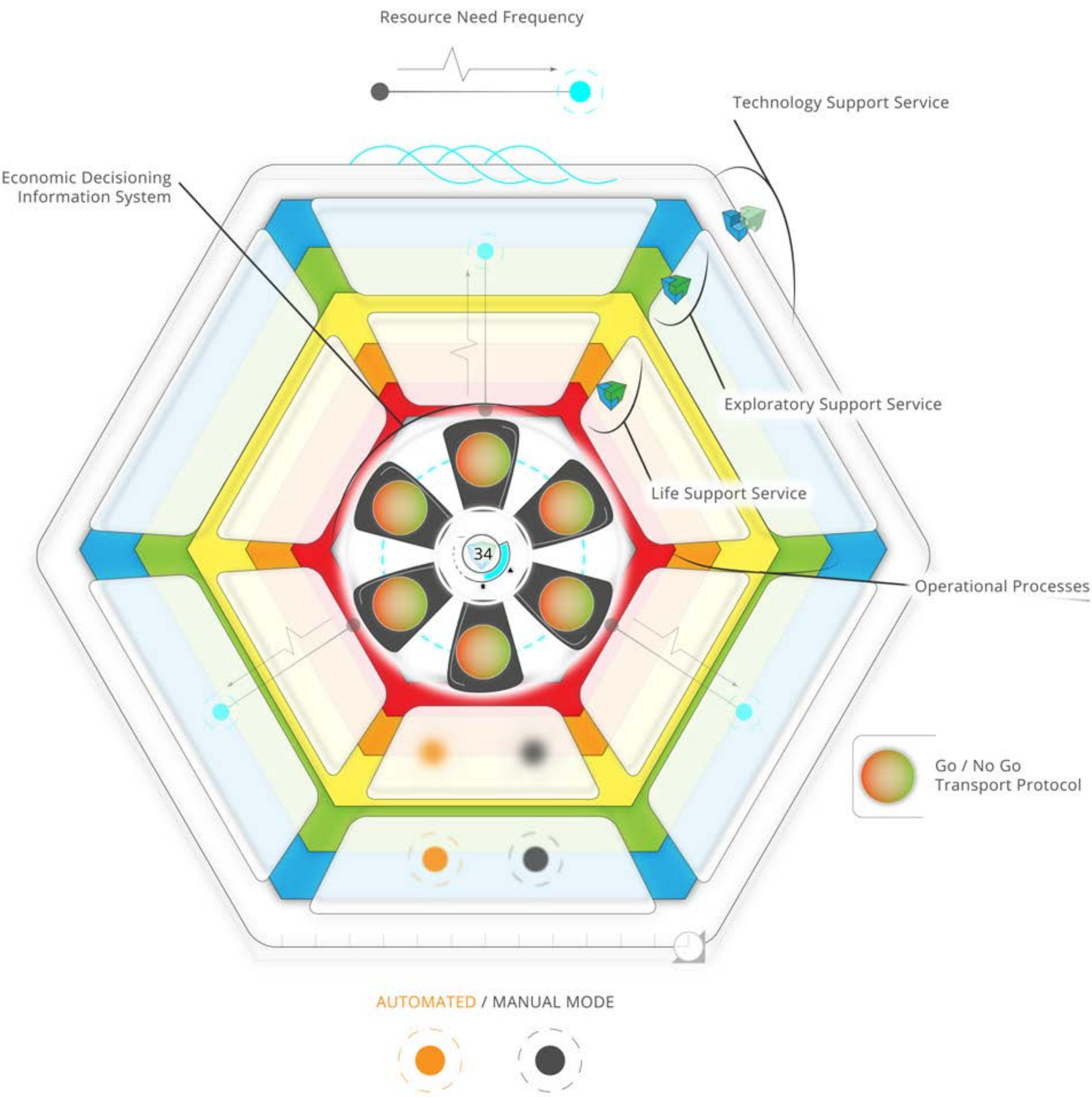

Figure 18. *High-level view of decisioning within a habitat structure where human needs are fulfilled based on a priority of life, technology, and exploration services, to which resources are allocated. Herein, habitat configurations are decidedly selected based on a set of serial and parallel go/no go inquiry [threshold] processes that result in an operated habitat service system. Services within that habitat may be automated or manual, or somewhere in-between.*

In Qu'est-ce que la Propriété?, Pierre-Joseph Proudhon (1840) addresses this concept of property. He specifically refutes the argument that property is the result of mixing one's labor:

> *I maintain that the possessor is paid for his trouble and industry in his doubled crop, but that he acquires no right to the land. Let the laborer have the fruits of his labor." Very good; but I do not understand that property in products carries with it property in raw material. Does the skill of the fisherman, who on the same coast can catch more fish than his fellows, make him proprietor of the fishing-grounds? Can the expertness of a hunter ever be regarded as a property-title to a game-forest?...*
>
> *To change possession into property, something is needed besides labor, without which a man would cease to be proprietor as soon as he ceased to be a laborer. Now, the law bases property upon immemorial, unquestionable possession; that is, prescription. Labor is only the sensible sign, the physical act, by which occupation is manifested. If, then, the cultivator remains proprietor after he has ceased to labor and produce; if his possession, first conceded, then tolerated, finally becomes inalienable, — it happens by permission of the civil law, and by virtue of the principle of occupancy.*

He also argues that if the principle that labor-mixing led to property was valid, it could only lead to equality of property:

> *"Admit, however, that labor gives a right of property in material. Why is not this principle universal? Why is the benefit of this pretended law confined to a few and denied to the mass of laborers?*

If the laborer, who adds to the value of a thing, has a right of property in it, he who maintains this value acquires the same right. For what is maintenance? It is incessant addition, — continuous creation. What is it to cultivate? It is to give the soil its value every year; it is, by annually renewed creation, to prevent the diminution or destruction of the value of a piece of land. Admitting, then, that property is rational and legitimate, — admitting that rent is equitable and just, — I say that he who cultivates acquires property by as good a title as he who clears, or he who improves; and that every time a tenant pays his rent, he obtains a fraction of property in the land entrusted to his care, the denominator of which is equal to the proportion of rent paid. Unless you admit this, you fall into absolutism and tyranny; you recognize class privileges; you sanction slavery.

Another important question that such capitalist thinkers must ask themselves is, What about someone who is employed by a capitalist and is also investing their labor in land. In such a case does the employee now somehow acquire the land capital [from the land owner] after the mixing of labor? If the capitalist won't give it to them, should they acquire weapons and take it for themselves, as they have "rightly mixed their labor" with it? And, if "investment" of labor in land is a foundational principle of this particular form of the free-market philosophy, does it not outweigh any following negotiated contractual agreement? Can a contractual agreement qualify a foundational principle of a philosophy?

In truth, the belief that mixing ones labor with land leads eventually to the demand for rent from anyone else who might also decide to mix their labor with that land. Proudhon makes clear that the reality of land ownership has no relation with labor-mixing, since one can own a piece of land and stop laboring on it, either by sitting on it or by hiring others to do it instead. This leads to rent [seeking] and the inherent contradictions of "property".

Above, Proudhon was talking about the cultivation of land, but the following rebuttal of labor-mixing applies to capitalist work contracts as well.

From ethicist Brian Zamulinski (2007):

> *Now, suppose that two people work together. Although it may be difficult, if not impossible, to determine the shares of the two in the product in practice, if people acquire property by mixing their labour with things, it must be the case that each owns a share proportional to the labour performed that actually went into the product. Otherwise, one is appropriating the property of the other.*
>
> *If one of the two is the employee of the other, the problem is that the share that the employee receives will be determined not by the amount of labour he contributes but by competition with other potential employees, assuming that there is freedom of contract. Occasionally, he will receive proportionally more than he should but other times, he will receive proportionally less. The latter outcome will occur far more frequently than the former. Either way, the employee will almost never get what he deserves in light of the labour-mixing theory of property acquisition. It will be a fortunate accident if he does.*

Zamulinski goes on to rightly point out that the end product of capitalist work contracts is incompatible with labor-mixing theory, and that in order to make any sense of their own position, capitalists must logically abandon labor-mixing as their justification for property. In this he again joins Proudhon. I don't know if Zamulinski believes there is any valid justification for property, but Proudhon definitely did not, at least at the time he wrote Qu'est-ce que la Propriété? (his opinions did change quite a bit as his thought evolved).

In truth, Land is land and it doesn't need someone's labor to continue on as land. In fact, someone's labor can harm the biological diversity of an area of land and make an area of land less liveable for themselves and others. The opposite is also a consideration, someone can "caretake" an area of land and improve its general fertility and life sustaining properties.

It should be noted here that the idea of mixing one's labor with land to create something more has led some noted individuals (e.g., Ayn Rand) to some unfortunate conclusions. These individuals have somehow acquired the belief that if a group of people are "too primitive" to understand what property rights are and are being "unproductive" with the land, then those who understand property rights and are willing to labor to be "productive" with the land ought to take it from the "primitives".

In simple terms, there are three categories of ownership: land; financial, and business. Land owners make money off renting out the land. Financiers make all their money off their financial investments. Business owners survive by making a profit off of their extraction. Therein, laborers generate everything that each of those 3 categories of owners benefit from. Yet, the laboring masses end up with the least.

> **INSIGHT:** *Competition for economic survival generates a scarcity-driven social-technical mentality (i.e. a scarcity-mindset / scarcity psychology).*

6.7 Scarcity and property

> *"The urge to own grows as a natural response to an alienating ideology that severs felt connections and leaves us alone in the universe."*
> *- Charles Eisenstein (2011)*

It could be well argued that only a perverse society would wilfully choose to persevere with a system that knowingly preserves scarcity for profit [continuation] and establishment preservation when it is intellectually clear that such a condition is no longer needed, and hence, any such related human suffering is also no longer needed. The market economy is not just a response to a scarcity-based worldview, it is also a preserver of it. The market structurally requires a high degree of scarcity, as an abundance focused society would eventually mean less labor-for-income, less turnover and less profit on the whole (e.g., tendency for the rate of profit to fall as technology develops). If society woke up tomorrow to a world where 50% of the human job market was automated and where all food, energy and basic goods could be made available without a price tag due to increased efficiency, needless to say the job market and monetary economy as we know it would collapse.

There is a belief that without property rights, there will always remain the possibility of conflict over contestable (scarce) resources. The argument for the belief goes on to state that by assigning an owner to each resource [possibly imaginable], a legal system then makes possible conflict-free use of resources possible, by establishing visible boundaries that non-owners can avoid. Note that this belief presumes the existence of a market of (a) contestable resources and (b) the persistence of not only scarce resources, but scarce goods and services also. And further, it makes the claim that a legal system of [violent] enforcement will make a conflict-free environment. Fundamentally, this is an example of what some refer to as "truncated thinking" (i.e., thoughts that haven't been fully developed to reveal their contradictions and misunderstandings).

Fundamentally, property never truly makes sense, even under the claim of conditions of scarcity. In the case of private property, there would be no reason to demand exclusive control over and access to things if they were numerous and in abundance. Here, it is important to note that scarcity can be artificially induced and in a state of competition it unwise to reveal ones entirety of resources to one's competitors. Hence, in the market there will always exist some degree of artificial scarcity because market competitors do not desire transparency. And, if and when there is real scarcity and there is property, and what some people need for their survival is privatized, then what happens when the resources begin running dry?

The very idea of "ownership" builds on the notion of scarcity. The thought that there is not enough of nature for every one of us. Hence, it generates a [protectionist] hoarding type of mentality such that even if there were enough the hoarders would be remiss to share. Therefore, it is best to hoard as much as we can while we can. If we don't, we risk being without, not having access and having to live a poor life. Simply put, property incentivizes hoarding behavior.

As a community, we understand that whenever a given resource is truly scarce, it becomes out of the question to access it at the expense of others.

In community there is no capital-property cost, no profit, and hence, no price. It is similar to Jeremy Rifkin's idea of a zero-marginal cost society [with the market completely removed]. For example, you can have 5 students in an online automated course or you can have 100 students, it wouldn't cost any more per student. In other words, more people can be serviced with less resource usage, which may be brought to the point of no capital expenditure at all, hence, no price.

Technological automation might bring those marginal costs to near zero; making goods and services essentially free, abundant, and beyond profit and the exchange capitalist economy. The marginal cost phenomenon has swept through the information goods industry over the last 15 years. People have begun to create and share without industry, bypassing industry.

We think as one species.

The sun on your roof is free. The wind flowing through the local atmosphere is free. The geothermal energy underneath you feet is free. You just have to move it through a material designed for a purposeful function, which becomes technically optimized over time.

We bypass industry through sharing.

When the marginal cost reaches zero, there are no longer any profits. In other words, when marginal cost reaches zero because individuals and communities have sufficiently fixed a sustainable design and production capital, then there is no possibility for profit and there is either collapse or transition.

In a capitalist market, sellers are continually in search of new technologies that can increase productivity, reduce marginal cost so that they can put out cheaper products, win over consumers from their competitors, and bring in profit for their investors. So, businesses have always wanted to reduce marginal cost. The general economic theory of capitalism says that the marginal cost is the optimal efficient state in which to price a good or service. Never in their wildest imagination did economists anticipate a technology revolution whose productivity was so extreme that we could build robots to service our needs and other robots to maintain those robots with minimal requirement for human interface.

Technological efficiency over times removes the human factor (i.e., the "labor factor") from the value equation. Capital + technology = deliverable value. At a real level humans are increasingly unnecessary in economic production.

6.8 The encoding of property

> **INSIGHT:** *Systems can exhibit behavior that no individual person in the system finds desirable. Therein, societal failures put all of our lives [in society] at risk.*

The encoding of property into a socio-economic environment carries a host of consequences. When physical things (often starting with self-ownership and land ownership) become property it is a slippery and often violent slope down to ideas also becoming property and the usurpation of the minds of a "citizenry" to maintain the foundational belief in property in "particular" and "rights" in general. The claim by those who believe in privatization is generally that private ownership enhances personal freedom. And, this may be true to a limited extent for those who are owners in a competitive and structurally coercive system. But, it also leads to vast concentrations of wealth and the effective denial of freedom and power to those without great wealth.

Therein, State ownership muffles differences in wealth and some of the abuses of individualistic ownership, but replaces them with the often worse abuses of bureaucratic, possibly fascist, control through violence. Both systems of thought, the State and the market conceptualization of property, treat the land as an inert resource (or "externality") to be exploited as fully as possible and used in bargaining, often with little thought for the future or respect for the needs of human and non-human life that fundamentally require fertile land and unpolluted natural resources to survive.

A system of ownership is also a system of elitism because those who own more resources have more power than those who own fewer resources. It is often said, correctly so, that in a monetary market you are only as free or as powerful as you are monetarily wealthy. In other words, those who exist under a system of ownership are sometimes said to only be only as free as their degree of ownership or purchasing power (i.e., their capital power).

All rights to property are destructive and unjustified for they are exclusionary, abstract and protectionist principles enforced ultimately by violence while further based upon a mindset of competition and/or a belief in authority.

Property provides opportunity for injection of a power establishment and an authority-oriented infrastructure wherein "exclusivity" [of property ownership] and "monopolization" [of violence] become normalized as reward and punishment. Property provides an opportunity that can be seized and played for all its worth in a competitive game for life. Therein, the removal of "one's property" is a punishment and the granting, endowing, and subsiding represents a reward. Fundamentally, property is a functionally useful structure for exclusion, exploitation, and control. Herein, underlying inequality in the ownership of productive assets forces the majority of non-owners to submit to exploitation by selling their labor to the owners in order to buy their work products back from the owners. Over time, capital is accumulated in organizations that have been legislative to exist like human beings and the ecology exist. These inhuman (a.k.a., impersonal) organizations become the owners of the labor, the sellers of product to the works, and the interest earners.

6.9 Structural violence, competition and property

> **INSIGHT:** *The modern monetary economic system needs the perpetuation of problems in order to continue functioning. If the problems ubiquitous in the system were resolved, then the system would collapse. It is, in many respects, predatory.*

Structural competition is, by all practical purposes, structural violence. A social system that removes the basis for people to complete in as many areas as possible would be optimal for it would provide the potential for synergistically fulfilling human need, and hence, reducing structural violence. 'Structural violence' is a concept with an empirical meaning - it describes violence embedded within a socio-economic structure as: (1) the degree of force and/or coercion over self-initiated exploration by an individuated consciousness -- the degree of extrinsic force applied to an individual and the limitation of intrinsic learning and intrinsic participation by that force; and (2) the degree of well-being of the individual in relationship to what is known to be possible. Herein, structural violence takes many forms, some are more subtle and others more gross, but all forms involve the denial of access to one's own internal power and to needed fulfillment. More precisely, structural violence is a form of violence generated from a social structure and/or economic institution that harms individuals by preventing the fulfillment of their needs. In other words, when a society is setup in such a way that it may harm people by preventing them from meeting their needs, then that is known as 'structural violence'.

The very notion of structural violence calls individuals to recognize the environment as a factor for all events that may initially appear to be set in motion by a single individual. Hence, the concept of 'blame' (or, blaming any one individual for their actions) becomes a non sequitur. Structural violence is violence which is built into the [systematic] structure of a society, though its expressions may be most apparent and tangible at the personality level. But, to stop one's thinking at blame (or, blaming the individual) is to truncate ones thinking prior to a systematic understanding of the whole context, which includes the structure of a socio-economic system that facilitates or thwarts fulfillment, and hence, generates specific systematically induced behavioral attributes [in individuals].

Practically speaking, a structure is a set of rules (a rule-set). Some socio-economic structures define and produce the existence of winners and losers, every day. Such systems simply define that the winners will get most of the resources, or the opportunity to access resources, and others will get less ... on down to positions where people get nothing (or next to nothing) from the system (because they are the "losers").

It is essential to recognize that violence can be built into the very structure of a social and economic system. A structurally violent society can be seen (or otherwise experienced) through its behaviors, its material constructions, and its conceptually believed in limitations. One might say that structural violence becomes "encoded" into the socio-economic system programmatically through cultural conditioning and re-conditioning [of its own signals]. Notice that structural violence is multi-spectral. It consists of several interconnected spectrum, which may be said to materialize (or "manifest") themselves in real material structures and real human behaviors, which thwart need-fulfillment in various ways.

Property is an anti-social system. In other words, capitalism isn't a social system, it is an anti-social system. It is predicated upon a refusal to acknowledge commonality at any and every level, particularly at the level of a common lifeground. And metaphorically, "the chickens always come home to roost" upon an unsustainable [socio-economic] system; whereupon no one is immune. None of us live in a bubble; we aren't immune to the socio-economic system and everything that goes wrong (environmental degradation, increasing stress levels, increasing employment or unemployment, decreasing health) affects everybody, rich and poor alike. Real success is defined by the type of relationship "you" are in with everything around "you" -- if it is mutually beneficial, then there is success.

Structural violence refers to systematic ways in which social and economic structures harm or otherwise disadvantage – it is psycho-social, chronic stress. Violence is more than physical damage trauma can be caused with words and every system sculpts [a set of] behavior[s].

Violence is a process, not a singular act. We raise aggression in defense and when we realize that if we desire to live together as a society we need to take down the fences that separate us into our own little fiefdoms, which structurally disadvantage everyone.

The system does affect people and will screw them up if it is a screwed up system. What do you think a screwed up system does when it conditions someone else? It screws them up to. The violence triggering signals must be dampened and designed out of the system if we desire true fulfillment and well-being. And, at the same time we need knowledge and self-reliant individuals capable of designing violence out of the system – this is the only true change and if you don't see it then you don't see "change".

Every act of commerce is an act of competition in some way. Take a "job" for example: "you", as an employee, want to get the highest possible pay from your employer. In turn, s/he wants to get the lowest possible rate for employment. You want the job, and so might another person. The laborer is just something else that is being bought. The laborer is selling themselves for their survival and the fulfillment of needs. All commerce involves payment, exchange, and negotiation between market forces (and entities). The very term "negotiation" implies a type of conflict, of competing interests, possibly "warfare", to get the lowest price for something that "you" *want* to buy (and "another" *want* to sell; the paradigmatic construction of a society of 'wants', not of 'needs').

> **INSIGHT:** *The market has no corrective-feedback for maintaining equilibrium [in the fulfillment of human need], and hence, one might imagine that stress builds up in the system.*

People can be "coerced" into doing things just on the premise of authority or maybe they just not wanting to rock the boat, or maybe they want that extrinsic reward they might get in exchange (more currency for more exchange). Wake up people; we are sailing in the wrong direction. We are here to throw each other life rafts that we might sail into a more thought responsive environment with greater well-being.

Gandhi knew this, he said, "Poverty is the worst form of violence". Martin Luther King spoke about this regularly before his assassination by the State; apparently, he wanted to see equal income. He said, what we have is basically economic bigotry and we need socio-economic stability. What we have is economic bigotry built right into the social system because of market capitalism's inherent propensity to create inequality [in economic access, and hence "social class" stratification]. Which, people love if they believe in Social Darwinism - everyone walks around reinforced to think that they are better than everyone else because of their property and status. Inequality is highly caustic to a society; it burns out social cohesion into socially stratified layers of socio-economic “class”, all competing within and against one another.

The scarcity-driven worldview coupled with narrow self-interest which persistently gravitates toward competitive advantage will always push forward the inevitable ... the collapse of the system.

The market will always lead to power consolidation and advantage as with the State (or mafia). The “market” and a “government” are just variations of that which follow from a belief in authority and the generation of a hierarchically dissonant socio-economic system. The mafia only happens to exist outside of what early 21st century society considers to be the frame of an acceptable playing field. The mafia is not an amoral anomaly [in the market].

In the study of microeconomics, John Nash (the nash equilibrium) and those others who came forward in the 20th century who investigated capitalism, they will use only one theory for their perspective, and it is known as ‘game theory’. Game theory is just that. In a competitive environment you are playing a competitive game where some people are going to win and others are going to lose. In that climate you can’t have social equality or any type of equality, in actuality, for the game is competitive and non-cooperative (i.e., a different value orientation is encoded, foundationally active).

> **QUESTION:** *Why do we need to be dependent upon trade and on the market? We take care (i.e., caretake) of what belongs to all of us.*

Competition in a market place, particularly when people are competing over resources that are vital for our survival, is a breeding ground for violence. There is cooperation in the marketplace. They are known as cooperatives. Structurally encoding a competition instead facilitating a self-initiation exploration of what really exists in nature is only going to create problems, structural problems.

Each individual is so full of potential, yet what holds us back includes environmental structures of a lower potential. If there is any such thing as a “right”, then it is the right of the individual to claim their own power, to actualize the tools of self-reliance and stand up to and design away from oppression. We think and cooperate freely come what may. We stand up to oppression by cooperatively designing.

Culture can quite easily divide humanity’s understanding of its very self-nature into abstracts identified by non-tangible ideals that create exclusion and discrimination out of which some humans believe they are more worthy of having their right to have more capital and security than others -- this is a collective form of compliance that has turned into a persistent state of abuse (or structural violence) that many have accepted and allowed by virtue of blindly binding themselves to the current economic and political culture that is founded upon the polarization of society between the have (“my property”) and the have not (“not your property”).

Structural violence can even extend to self-labeling. When you call yourself an Indian or a Muslim or a Christian or a European, or anything else, you are either being violent or you are only a slippery sloped road to violence and conflict. Do you see why it is violent? Because you are separating yourself from the rest of mankind. When you separate yourself by belief, by nationality, by tradition, by skin, by cognition, it breeds violence. So, someone who is seeking to understand violence does not belong to any country, to any religion, to any political party or exclusive system; s/he is concerned with the total understanding of humankind. These labels are externally conditioned identities, some of them might even be ‘socially engineered’ (as in, a product of propaganda). Here is the correlated understanding: The term “foreign relations” [nation] is “public relations” [corporation] is “propaganda” [military] is advertising & marketing [business]. In some sort of an integral truth, we are [f]actually all “Earthlings”. When we see others as separate from ourselves we have a propensity to treat others inhumanely. Some might say that “violence” is too strong of a word in this context, but violence is nearly always the end result when we separate ourselves into different social groups and then try and compete for limited resources.

When there is a society for the advancement of certain people versus all people, then can you not see the violence or at least the conflict that such an organization will create? We are one planet and there is no independence. We are one species; there is no basis for superiority or inferiority.

Most people don’t associate the forced paying of taxes as violence because they view violence differently. When they see physical violence they recoil, but violence can occur regardless of whether they see (“perceive”) it or not. The wording in the context of “taxing” is not something that makes them comfortable and they have attached other meanings to the word. Hence, the term “bad government” coined as a euphemism. What is taxation essentially if you were to draw out a conceptually related map of the market, the state, and the citizen? Taxation is a form of violent extortion. Someone has the legitimized power to coerce another [by force] into doing something they otherwise do not desire doing (or relinquishing possession of) and if they don’t do it they will suffer and escalation of what ... of violence of course. Therein, violence requires the monopolization of force, which creates certainty (artificial as it may be) in the minds of those with the power and property.

They have a conditioned understanding of the meaning of the word, narrowly defined by those who would rather not appear to be seen acting in the true manner in which they are acting. And that conditioned understanding generally results in a narrow use of the term “violence”. They become unable to see the violence fundamentally present in taxation or in the market. The presupposition gives them an incomplete picture of the reality of the situation itself, while in the process creating superficial conversations, contexts, and systems.

The market economy is culturally unsustainable because it perpetuates inequality by its very design, it is inherent and inbuilt. Its predicated incentive structure generates conditions of scarcity. In a scarcity-based worldview narrow self-interest will prevail and reinforce the generation of scarcity in equality.

Adam Smith in his work entitles "Wealth of Nations" speaks of self-interest constantly as a virtue. Which is a fair idea, but if you have a self-interested worldview in a scarcity-driven society then it will consequently lead to competitive behaviors. And, competitive behavior will always amalgamate into gaming strategy for power consolidation, such as the State, or the operation of the Federal Reserve, or what the FDA has grown to become; a state of massive collusion working for self-interest, for "special interests", and for special groups. The Federal Reserve is not some anomaly, it is exactly what should be expected and predicted from the model of society that is presently in place. If you have these pockets of consolidation, if you have this constant drive toward competitive advantage, then you are going to have constant imbalance in fulfillment as a continuous mathematical result.

The very structure of the modern socio-economic system creates inequality. And, if there is inequality, then there will inevitably be conflict and psycho-social stress. Under such conditions there is likely to exist absolute deprivation and relative deprivation:

1. **Absolute deprivation** means that if you are poor [in wealth], then you don't get your needs met, you don't eat well, and you might susceptible to highly toxic environments from your living conditions. Absolute deprivation says that the absolute opportunities and resources available are not sufficient to generate a state of nourished fulfillment. When physical needs are not met then sickness and premature mortality results.
2. **Relative deprivation** is more insidious because it has to do the social nature of the human organism and the way we perceive ourselves in the social hierarchy. Relative deprivation is the lack of resources to sustain the diet, lifestyle, activities and amenities that an individual or group are accustomed to or that are widely encouraged or approved in the society to which they belong. It results in mental, emotional, and physical disorders from stresses associated with being on a lower wealth tier in a hierarchical/class-stratified society.

Together, these two forms of deprivation constitute what is called "structural violence". The term "structural violence" is commonly ascribed to Johan Galtung (1969), which he introduced in the article "Violence, Peace, and Peace Research". The article refers to a form of violence where some social structure or social institution harms people by preventing them from meeting their basic needs. It was expanded upon by other researchers, such as criminal psychiatrist Dr. James Gilligan, who makes the following distinction between "behavioral" and "structural" violence: "The lethal effects of structural violence operate continuously, rather than sporadically, whereas murders, suicides...wars and other forms of behavioral violence occur one at a time." (Gilligan, 1996)

Humans are deeply social organisms, it is built right into our evolutionary psychology. And, when we see other people that are doing "better" or at a "higher class status", which is exactly what the monetary economy creates with its inherent wealth division, it causes chronic stress (not controlled episodic) in us. The way we think about ourselves has incredibly inhibiting effects on the way our bodies and our minds work.

In the market, entities have niches (or "territories") that they occupy and sometimes dominate. How then can any market entity become a steward for, or caretaker of, the planet? Competing niche entities leave monuments to themselves and their own cleverness, and not "richer soil" in return. Oddly, one of the much beloved characteristics of an entrepreneur is his/her exploitation of a niche market - this is essentially what entrepreneurs do, they create or otherwise discover niche markets and then they exploit them. Commerce is fundamentally allowing of exploitation, and it is incentivized in lifespace competition. What incentive is there in the market for human lifespace to care about exploitation and "social justice"? In the market, the government becomes someone to appeal to for issue resolution [because they have a monopoly on violence]. Herein, market philosophers claim that if only the State was removed, the "market" would somehow create some form of equilibrium where there would be little (or no) exploitation in a competition oriented lifespace. Firstly, any structural exploitation re-creates government. Secondly, the market is an unnecessary agreed upon social abstraction with a host of undesirable structural consequences, of which niches (or "domination territories") are an example. Third, how will the State be removed? If the State is to be removed through design, then why not remove all potentially unsafe and inefficient social abstractions (i.e., remove the market also). Every ecological system has limits; to establish competitive domination territories [at scale] is unwise. The simple sharing of ideas in a "market" represents "the market" scaled down to its most refined and essential form without layers of harmful social consequence. Fundamentally, the market-State is a system that generates social class division.

6.10 Self-ownership and property

INSIGHT: *Having and owning less stuff feels like, relief.*

Self-ownership is the concept of property in one's own person, expressed as the right of a person to have bodily integrity, and be the exclusive controller of his own body and life. The concept is most often articulated by the statement, “I own myself”. Essentially, under a property-based self-ownership paradigm there are two ways to perceive self-ownership: 1) We own ourselves and no other person or group of people, regardless of their number, has any claim to our person; and 2) We are slaves, and others may have a claim to our body and tell us what we may or may not do with it. Also, it is said that self-ownership leads to autonomy, self-sovereignty, and ultimately “property rights”.

The idea of “self-ownership” has a host of standard [property-oriented] problems.

First**,** the concept is self-referential. Ownership is a relation between owner and owned. Now, take the phrase, “You own yourself.” As a point of logic, notice the usage of the word “you” twice in the declarative sentence. This leads us to the rather disappointing conclusion that “self-ownership” means “the body owns the body.” But this is an utterly trivial and useless proposition. When I say “I own this chair,” I mean nothing more than the fact that I legitimately control the chair. But there can be no relationship of control between an entity and itself. If there is no distinction between owner and owned, then the relationship of ownership does not, and cannot, exist. The body itself is a moral agent (a “self”), and therefore it cannot possibly be owned by anything or anyone. In other words, do you own yourself or are you yourself.

Note: When consciousness is embodied it is not distinct from the body. Hence, one cannot say that consciousness is that which owns the self. If, for example, your arm is severed from your body, and it falls on the ground before you, though it no longer is attached to the rest of your body, it most certainly remains a part of your body. It is at this point that your conscious and your body (although only a partial amount of it) have become separate, and the clarity of the ownership relationship between your body and your body becomes clear.

If something is owned, then by definition there is something external to it that is doing the owning. Likewise, something that is owned is by definition something external to the agent that owns it. To say that “you own something” implies that there is an owner. Whom, then, is this thing that is “owner”? Conversely, take the phrase, “You can’t sell your labor because you are your labor” [see, no abstraction]. Do you actually own yourself or is this a deconstructive abstraction of that which you are? The problem with this argument is that you don’t own yourself, you are yourself; you are your body. To say that you own something implies that there is an owner and a thing that is owned. You can’t sell your labor because you are your expenditure of effort through a body. Otherwise, people would go back to sleep when their alarm clock goes off, while their labor goes off to work.

Ownership = owner + owned. So, what is self-ownership? It must be the self, owning itself. Self-ownership seems to claim owner and owned are the same unit. How can ‘it’ “be” us and ‘it’ “own” us at the same time?

Further, there is no such thing as a static self, at least in the common conception of what the “self” might be. A saner concept of the self may be to define the self as a [dynamic] process of experience, not as fixed states (or the fixed state of “property” re-creation).

The “right of self-ownership” is often referred to as a “natural right” by the group of philosophers who believe in self-ownership.

The idea of self-ownership carries with it the bizarre logic of “if I don’t own myself, then others do”. Fundamentally, a philosopher can still speak of the invalidity of claims of ownership made by other people without having to invoke self-ownership. People are not property, whether others property or one’s own.

6.10.1 Self-ownership and slavery

QUESTION: *Do I own myself, or am I myself?*

The idea of self-ownership leads to slavery in two different ways. The first is mental slavery and the second is very much physical.

The first way in which self-ownership leads to slavery: if self-ownership is true then how is it possible to define slavery? After all, slavery is commonly defined as the ownership of another human being. But, we can see this is quite impossible. A slave-owner does not own the free will of his or her slave: all s/he can do is issue orders and back them with threats, and the might of the State (when it is available). If it was possible to actually own another human being, then one would not need any orders or threats, but simply to will the other human being to act in this or that way, just as we do with “our own bodies” (this common turn of phrase, having been disproven, must now be put between quotes).

What the slave-owner owns (illegitimately, may I add) is not the human being itself, but rather the rights of that human being. The slave is seen as being unjustified in any act of force, and the right to use force in defense of the slave is now owned by the slave-owner. The slave owner is justified in using force to defend the slave, because he wishes to defend his property. But, the slave owner is also justified in using force against the slave, and the slave (according to the doctrine of slavery) has no rights against him. In short, the slave is treated as any inanimate object, a chair, a desk or a plank of wood, which by definition have no rights.

When the State stakes its claim on what we can or cannot do with "our" bodies, this should also not be seen as claiming ownership over us (unless a "Statist" declares this, in which case it is a contradiction). Rather, "we" should see it as an attempt by the State to gain more “positive rights” against us. Indeed, what the State is basically doing by, for instance, banning drug use or abortions is to treat "our" bodies as something that is contained within the State, that belongs to the State, and that can therefore be protected by force by the State from "our" own actions. If "we" accept the democratic premise that "we" are the government, that "we", our bodies, are part of the State, then it is no wonder that the population of the planet in the early 21st century accepts such unjust laws.

Most people cannot accept the idea of people being rented, bought, sold, or murdered. Yet these are all rights inherent to property. This tells us that people probably don't literally believe in self-ownership. And, if you ask people about it, they will usually reply that self-ownership is a metaphor for liberty (being free from constraints) or some similar concept.

The idea that a man or woman owns his or her own body is the same idea being put forward here by the concept of self-ownership. The idea of self-ownership is the foundation of the "theory of contract and promise" (and by extension the problem of "voluntary slavery").

But, if this is the case, then the argument that "the woman owns her body, therefore she is free to do what she wants with it" becomes a tautology: "the woman is free to do what she wants, therefore the woman is free to do what she wants." And, if the argument is tautological, then it proves nothing at all, certainly not the validity of abortion anyway.

The second way in which self-ownership leads to slavery: when people are property, then slavery is likely present in some form. The idea of "slavery", itself, exists along a spectrum from complete ownership of someone else's body, actions and mind, to relatively easy ownership, such as modern market employment. Those who believe in self-ownership are often capitalist philosophers who concurrently believe in the "free-market" and its ability to solve (or at least significantly diminish) humanities ongoing problems without the State. A market entails several concurrent concepts including the ideas of "property", "business", "profit", and "employment" (and the market itself may be principally subdivided into "consumers", "employers", and "laborers"). Someone who owns themselves, but does not own a business, must submit (or "exchange themselves") to labor for an employer in order to become a consumer and survive in the market (as a state of lifeground competition for needs). The cycle itself is a form of slavery, and this is why the very notion of employment in the market is sometimes called, "wage slavery" – people have to submit themselves to labor for another's profit in order acquire a wage from an employer in order to provide for their survival. This type of structure is often labelled as [coercive] "structural violence". In other words, the requirement of submission to employment is "soft slavery". Herein, the "submission" that is required in the market is [in part] due to the exclusion of others by the employing property owner who has the right to force others from his or her property and do generally what he will with the property, which is a justified extension of his/her self-owned property (i.e., himself/herself).

If "you" own "yourself", then "you" have somehow acquired the ability (and are now able) to sell "your" time and "your" body, and hence, "your" liberty.

Basically, when someone owns themselves, then they have the "right" to sell or rent themselves to others permanently or temporarily [by market negotiated contract] in exchange for something or other (possibly). Herein, we need to seriously ask ourselves, "Is that the type of society we wish to continuously re-create?" For, it is essentially a society where just about anyone [who can contract] could sell themselves into slavery ... might need to sell themselves into slavery ... might begin to desire the possession of a slave themselves.

Yet, at a fundamental level, humans are not property -- we are sentient beings with an embodied consciousness.

While the argument of self-ownership sounds interesting and even implies the concept of "liberty", the reality is the opposite. The very idea of self-ownership turns people into commodities. It strips the humanity out of humans. People can now be bought and sold in a structurally coercive market place. And on a larger scale, the commodification of human beings has striped the

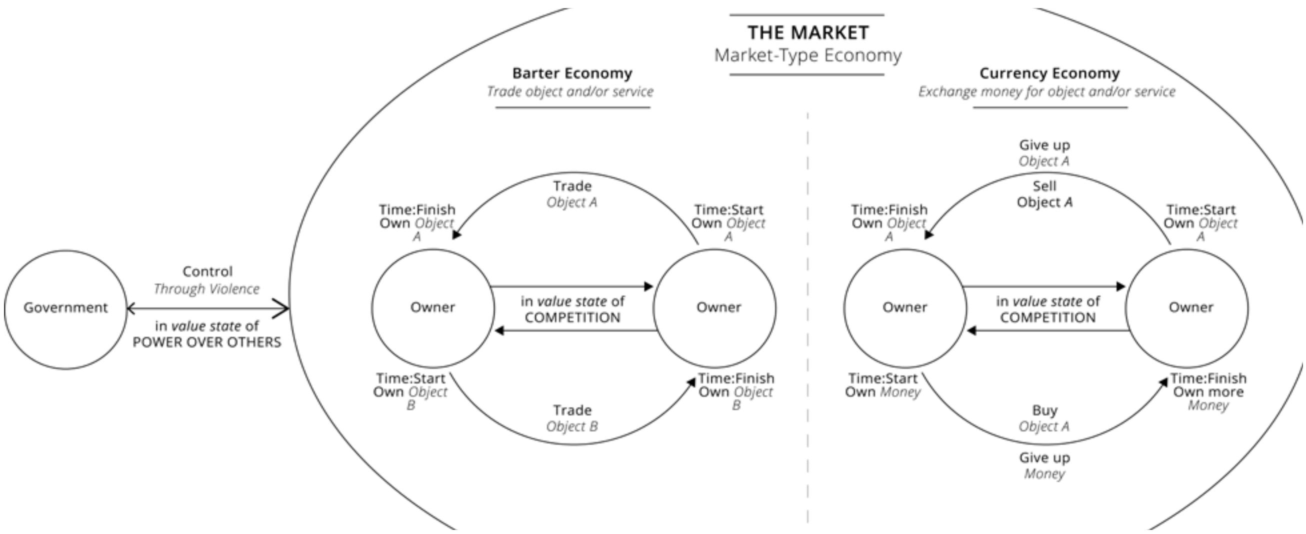

Figure 19. *Simplified depiction of the market where ownership and trade occur.*

humanity out of society, leaving a landscape devoid of human qualities and a people completely alienated from each other, a society in which we exist inside invisible cages that we structurally re-enforce through our beliefs.

In the market paradigm, the idea of self-ownership leads to the justified idea that mixing ones labor with land creates the private acquisition of that land, somehow. The justification for private property rights directly follows from this premise of self-ownership.

> **INSIGHT:** *During the period [in history] where the "means of production was [capable of being] owned by capital[izing] individual interests, therein, our lifecycle was a patterned loop of working to earn money to buy what we could have made ourselves better and more responsibly.*

In many ways, slavery is an automatic consequence of a monetary society. If an economy is based on the usage of money, and one's access advantage in that economy is based on how much money one has, so there is an automatic enslavement to money (Read: desire to have money) over the fulfillment of all. And, when humans can be traded for employment, then those low in the economic hierarchy will have to pay rent to gain access, paid for by job employment, which is created by an owner. Thus, wage slavery, where humans work for the profit of the owners (i.e., "the capitalist class") to access what they themselves (i.e., "the working class") make. Note, slaves through most of human history where classified as such by them not being considered legal persons, and thus, not capable of owning property. Wage slaves can own property, but mostly rent it from corporations and States. Most land, for example, is rented from States; if "you" don't pay a yearly land tax, then "you" will lose property ownership of the land to the State. In this way, the State is rent seeking, like corporations are rent seeking, where all seek to have money.

> **INSIGHT:** *The inequality in the world is "baked into the cake" of a market-State society. And, therein, if there are haves and have nots, the have nots are going to be most upset; and, the haves are going to have to protect themselves from the have nots and are going to have to protect the structure that allows them to continue to have over others.*

Most productive people in the market-State work to push "value" up the socio-economic industrial food-chain hierarchy. The "value" is going up the industrial food-chain to a small number of people. And yet, most of the "value" doesn't even reach them, instead "it" is being vaporized to turn it into 1s and 0s in a computer system. Herein, imagine "value" as work done.

Versus community, where productive people use a coordinated contribution service to meet the projected human fulfillment needs of all. Herein, values (orientations) are objectives in a decision resolution system where the direction for required real-world completion is human need fulfillment. The product of the work of contributors is a community-type society where the population lives in a network of coordinated common access habitats with free of trade/coercion services.

In the market-State, the patent system has been a brake on the progress of technology (as a production deliverable) to more greatly meet human need. Often, the patent system is claimed to be present to help start-ups businesses; but instead, it is a monitoring and accounting tool that limits the ability to freely (without trade and coercion) use pre-discovered technology.

"Players" participate in a game of competition by trading. When the players trade, money changes hands. When money changes hands, taxes (money) are paid (taken by coercion) to the State. When taxes are paid, the political party gets funded (money). When the party gets funded our utopia stays strong and everyone is better for it. When money becomes obsolete, so does the State. When money and tokens (non-circulating) as trade for labor (i.e., price) become obsoleted through community standards design, then the State as it is in the market-State becomes obsoleted too.

6.11 Self-integrated, goal-oriented response (SIGOR) and self-ownership

A.k.a., Self-direction.

If someone were to try and control someone else's embodied consciousness that would be tantamount to a moral violation of consciousness as a self-initiated, goal-oriented response. The idea of SIGOR doesn't require property, it only requires that consciousness access a body so that it may self-initiate in response to environmental stimuli. In truth, the ability of consciousness to express itself through a body doesn't have to be based upon the construct of property rights. Is it healthy to look at the entire world and only see property in others and in objects? There is no magical (intrinsic) bubble around things that are owned, whether it be the self (as in, self-ownership) or some tangible object. There is no such thing as "inherent property rights".

What is "property"? It is a human invented construct. And, if it is an invented construct, then how can a human be a human invented construct, logically? Regardless of whether human beings are exclude from property or not, there is no such thing as property, and its [con-structural] encoding into a socio-economic system is particularly harmful.

If ownership implies control we certainly can't control all aspects of our body. In this sense our body is collectively owned by millions of discrete life forms.

6.12 The paradigmatic logic of self-ownership

In the market paradigm of thought the idea of a self-ownership makes reasonable sense because everything in the market of any tangible worth or value has an owner. And further, in order to contract for employment one would justifiably have to own their labor, and if one owns their labor then naturally they have ownership over themselves.

Many political philosophers do not agree with the market-based logic behind self-ownership. Yet, and ironically so, they have a similar, though even more obfuscated idea, the idea of a "citizen." Political philosophers use different language than market philosophers; they might say, "A citizen is someone who belongs to a state, country, or nation." Or, even more euphemistically, "a citizen is a citizen of such and such a State" (which is also self-referential). It is unlikely that they would say "a citizen is someone who is owned by a government or State", though this is akin to the truth of the matter. The word "citizen" is just a euphemistic and more modern transposition of the word "subject". And, someone who is "subject to a government" is subject to its ruling. Subjects (or "citizens") are ruled by an authority [when subject to its jurisdiction, and sometimes even beyond its jurisdiction as the United States of America taxes its citizens on their worldwide income; an empire-building idea]. Most "respectable" political philosophers don't want to think of themselves as advocates for violence and slavery (in its modern form) and so they use different language. But, what is a "citizen" if not someone who has acknowledge the presence of a master (or authority) in their lives (regardless of a "social contract") who is a directing party in some way in nearly every action they take beyond their abode (and sometimes even in their abode). Unfortunately, neither Statists nor market "philosophers" go far enough and have made it all the way to an insightful understanding of freedom, justice, and true economic efficiency.

Where you live, can the government tell you what you can and cannot put in your body? Is any "drug" illegal in your country? Is suicide illegal in your country? Are medical practitioners forbidden from assisting in suicide? The criminalization of suicide or the consumption of any substance whatsoever quite blatantly indicates that some outside authority has a claim over one's body [and potentially one's mind if one were to feel that these things should remain criminal]. In most States, in fact, it is not illegal to "consume a drug", it's only illegal to possess or sell a "drug". Unfortunately, reality dictates that one must first acquire a drug and then possess it (if only for a short while) before consumption. Hence, although the consumption itself may not be illegal the criminalization of sale and possession is reasonably equivalent to a dictate of what someone can and cannot put in his or her body, which is also reasonably equivalent to a claim of control over someone's body. A free-market capitalist might ask a statist, "Do you own your body or does the government own your body and can tell you what you can and cannot put in your body?"

When we exclude world from self, the tiny, lonely identity that remains has a voracious need to claim as much as possible of that lost beingness for its own. If the entire world, all of life and Earth, is no longer me, I can at least compensate by making some of it mine. Other separate selves do the same, so we live in a world of competition and omnipresent anxiety. It is built into our self-definition. This is the deficit of being, the deficit of soul, into which we are born.

> **NOTE:** *The concept of "voluntarism" is principally characterized by idea of "self-ownership" - the idea that each individual owns (or possesses) themselves. "Voluntaryism" is sometimes also given the name "volunteerism".*

6.13 The double coincidence of wants "problem"

Most professional market economists believe that before there was money in its modern form people used barter, but it was very difficult for them because they had to fulfill a so-called "double-coincidence of wants", which claims:

> *"I have to have exactly what you want and you have to have exactly what I want. For us to make a trade the two thing have to be of roughly equal value so that we walk away from this one trade even (as if we don't have any ongoing relationship as members of the same community). And every time we do any sort of business with each other or provide for each other's needs we have to completely close the deal and walk away with no ongoing relationship or responsibilities to each other whatsoever." ("Coincidence of wants", 2020)*

This is something that Adam Smith described in his work, "The Wealth of Nations". Curiously enough, however, when explorers, colonists and various researchers travelled the world and found so-called primitive societies (i.e., tribal/indigenous peoples) they never found anyone operating the way Adam Smith said that primitive man was supposed to handle his economic business. And yet, 200 years of dis-confirmation doesn't seem to have thrown any sort of metaphorical cold water on this notion, for it is still found in economic textbooks. To a large extent, the economics profession, like any "profession", is intent upon self-validating its own core premises and projecting them onto the world.

6.14 Property delineations

Traditionally, there are three types of "property" delineation: private property, common property and collective property. It must be noted that in the real world "property" is not so easily delineated although property interests would like to imagine it so. Notice that these definitions are brief, they are also neither precise nor complete because when “property” is socio-economically encoded it takes on many additional characteristic and nuances of implication that entirely blur the lines between these supposed categories of property.

6.14.1 Private property

In the case of “private property”, an individual agent (usually persons, but also families, businesses, etc.) has a right to private property if he or she has a right to control the object and to regulate access. Control means sole decisional authority: the individual agent is the only one who has a right to decide what should be done with the object or what should happen to it.

6.14.2 Partnership property

A.k.a., Private partnership property, public partnership property, private business property, public business property, joint property.

Individuals who together own a share of a private production property (i.e., a property that does economic production). This type of property can either be closed, in that it is entirely private to a select group of legal persons, or it can "public", in that its [ownership] shares can be purchased in a financial ["stock"] market.

6.14.3 Common "property"

In the case of “common property”, the purpose is not individual control and exclusive access, but a claim of equal access to all [of the property]. A group of villagers can get together and say, “That grazing land over there, that is common property and we can all graze our cattle there”. Generally in the market, however, there is a caveat that if you are not from “our village”, then you can’t graze your cattle their without some payment to the village ... leaders. The claimed intention of common property is to stop people using it as if it was private property and as if others were precluded from using or accessing it.

6.14.4 Collective "property"

A.k.a., Democratic property.

In the case of “collective property” (sometimes also called joint property), the purpose is not only equal access to all but also equal control and decisional power. The community as a whole determines, through systems of “collective decision making”, how the resource is to be used. Each individual’s use is subject to a decision process. Collective ownership of a farm, for instance, means not only that all farmers belonging to the collective have an equal right to access the farm (as in common property), but also that all farmers have an equal say in the management of the farm. There is a subset of “collective property” known as “State property” (or “public property”). State property is property that the State claims is owned by all, but its access and use is controlled by the State [of an unowned collective]. It is important to note herein that not all collectives are benevolent in the market – different collectives may have very different value orientations.

In practice “public property” is more often than not treated as “private property” by those who have [collected] power over the property.

“Public property” is purported (Read: marketed) to be regulated by a “governing public body” and it is supposed that no one may be excluded from its use and that there is no rivalry surrounding its consumption. None of this is not true. Firstly, the rise to power, the election to political office, and politics in general are all based upon competition. Second, public property can never be held in “trust” by a government, for a government is a vast unowned and exploitable resource that uses violence as its mechanism of [exclusive] control. Further, what is a “governing public body” but a bizarre and euphemistic term for a group of people who have somehow won and otherwise collected the power to rule from a collective of people who have sacrificed their own power. The very idea that no one may be excluded from the use of public property is not true and has never been true -- take the government shutdown in the United States in 2013 when “public” parks were closed to the public and those found “trespassing” would be fined. Or, take a military installation for example. And, if you would like to find out just how exclusive public property really is, then try to walk into a “closed door” meeting between “public officials” which is being held on “public property” and you will no doubt quickly find out how “public” property and public officials are. In truth, the word “public” is meaningless and whenever you see it you should stop and question the structure behind it – nothing is ever “public”. To “believe in the public” is to believe in nothing at all – it is a hallucinatory mental orientation that is easily co-opted by those who seek power [to force others to do the things they want them to do].

6.14.5 State property

A.k.a., "Public" property.

State ("public") property is property owned by a State-government (or its agency), rather than by a private individual or a company.

6.15 Rights

A.k.a., Entitlements, properties.

If you ask someone for their definition of “rights”, their response will likely be founded upon their ideology, for the very notion of a “right” is based upon a subjective (or intrinsic) view of morality (or ethics) – a “right” is essentially an ethical principle (or a dictate) somehow formed into creation. More precisely, “rights” are commonly understood to mean entitlements to do or not do something, and for others to respect that entitlement. And, the "respect" element of the definition always reserves or involves a validation of the use of force. In a legal context, rights are positive liberty goods (conditions) said to be provided by the State. The only place rights exist are in the minds of people. Rights are political demands. For example, "Everyone should have the right to..." Rights are only necessitated because of conflicting economic interests within class-based societies. Rights are legal relations. Humans are not naturally endowed with any[natural legal "rights".

Rights are typically the basis for legal claims by individuals to be treated in certain ways and/or have certain allowances. Rights given by the State under market conditions quickly become the rights of the owner of private property to enjoy and dispose of goods, revenues, and fruits of labor according to arbitrary will and self-interest—without regard for, or interference from, others. Equal treatment under the law and security guarantee this individual freedom to all property owners. There is a history to the idea of encoding "rights" into society, and to the critique of "rights" by revolutionary thinkers of the late nineteenth and early twentieth centuries. As a result, social movements, instead of learning from and developing viable alternative model, they have discarded development to struggle with "rights", and feel frustrated that "rights" do not work, but have nothing to offer beyond "rights".

> **NOTE:** *Ethical principles teach that as all human beings "we" are required to do "right" and abstain from doing "wrong", this philosophical concept is supposed to guide people in "right" actions.*

Yet, market "rights" always imply aggression on other people. If I have a right to an education, then other people must be coerced into giving me an education, in accordance with whatever rules are set for this right by the ruling class (for obviously we must define and specify what an education is, in order to give people a right to it). If the educators in a given society refused to dispense such education, or disagreed with the rules proposed, then they would have to be aggressed upon to do so, since they would be breaking my "right".

"Rights" are defended, protected, and enforced. Rights exist within the conception of the State. To have any tangible value in competition "property rights" must be upheld by force and by "enforcers", such as police and ultimately a military. Rights are hard[ly] won and easily lost [to powerful interests].

> **QUESTION:** *Fundamentally, when speaking of "rights" one has to ask, from where do these "rights" come?*

6.15.1 The philosophers of capitalism and politics

The philosophers of capitalism in the eighteenth and nineteenth centuries radically transformed the classical idea of "rights" into a subjective political notion attached to individuals who became "right bearers" vis-à-vis the State and society. The idea of "rights" was transformed into "freedom from the State" and from social constraints. Therein, the corollary of this claim to "rights" became something known as "freedom" and "liberty" (or "sovereignty") as well as "choice" forming the absence of restraint. Today, most capitalist philosophers go by name "free-market capitalists" (or "anarcho-capitalists", "right libertarians") who claim that only "property rights" exist and that "property rights" are an extension of the ["right of"] self-ownership.

Today, the philosophical idea of "rights" exists at best as an ethical ideal because the political philosophers of capitalism have put rights on a different institutional and juridical foundation. When social justice activists speak of "rights" they have in mind this classical ideal, but often it is forgotten that the institutional and legal basis for the capitalist philosopher's notion of "rights" do not exist anymore. This is something free-market capitalists and libertarians are quick to point out. "Rights" have become a fundamental premise around which political arguments are formed.

Rights are seductive in that they offer "you" the feeling of security and represent the power of force over others to protect what "you" own [against the world]. In other words, rights involve the creation of a power hierarchy [of "necessary" force] to exclude the social from what is "rightfully mine".

Capitalism developed the idea of "rights" to new levels by introducing two components that radically altered the nature of "rights". First, philosophers of capitalism introduced the novel idea that property was a natural and inalienable right attached to every person in the same way as life (i.e., property is intrinsic to humanity), and it is the conditions that sustain life: air, water and food. Second, "rights" were articulated as negative juridical concepts, in that "rights" only guarantee the possibility of something, not the actual thing. Thus, the right to collective bargaining (i.e., "employment negotiation") creates the possibility of a living wage, but does not guarantee a living wage; the right to property makes it possible to own a home but does not promise everyone a house to live in.

The idea of "rights" in its modern form and as a political idea owes its very existence to property rights, and is inseparable from it; and the concomitant idea of "freedom" is about the freedom to own and accumulate property without interference from the State. Delineating and defining property rights for social purposes does not take away its primacy in the modern political and legal order. In truth, capitalism is impossible if property rights are taken out of the scope of "rights".

Some political philosophers (as those who believe in the State and do not believe that the State is a force of violence) also believe that humans (and sometimes other beings) are "endowed" (note, a notion of intrincisism) with "natural and inalienable rights" (i.e., "human rights" and "liberal rights"). In other words, the belief is that rights are intrinsic to the human biological form (or possibly the biological form of some other living being, and sometimes even non-living things). It should be noted here that most free-market capitalists would partly agree with this notion, but they would state that instead of being endowed with a set of "human rights", humans are solely endowed with the "right of self-ownership" [possibly derived from some sort of a "natural law", which is not equivalent to science's description of nature, a homonym known also "natural law"]. And, from their belief in self-ownership stems the anarcho-market ideal of "property rights".

Alternatively, political philosophers who believe in the State and are more real (or honest) in their advocacy for violence are likely to claim that rights come from some "authority" (as in, the State or a government) or are given by a "higher power". In this case, humans are either "naturally endowed" with these rights from the "higher power" or they are specifically given these rights through some sort of ceremonial action and/or transcription (e.g., a constitution) by a power-based authority [figure(s)] (often known as a "congress"). It is the unfortunate truth that people in early 21st century society claim that "rights" exist because "the government says so, or some piece of paper (a "declaration") with signatures on it says so" (i.e., civil & political rights). Of note, this is what the modern State schooling system was [in part] designed to do -- to condition the belief into the masses that government gives "rights".

In the political philosophers mind, rights are given from some authority or they are somehow intrinsic to biological form, most commonly, human. And once they are so, they must become protected by a monopoly on violence ... though not every political philosopher will be honest in this respect.

In each of these cases, a "wrong" is when someone is deprived of his/her "right(s)". Though ironically, rights are usually defined by defining wrongs. This represents one of the principle differences in how a society directionally orients itself. Does it attempt to [dis]orient itself by defining wrongs or does it orient itself by explicating and verifying values? The difference in structure will set a society on a different trajectory.

6.15.2 Negative and positive rights

"Negative rights" are rights that are inherent to the human being and not given to human beings by government. Negative rights are the capitalist philosopher's notion of rights. Alternatively, governments exist to give humans rights (a.k.a. "positive rights"). Positive rights foundation the political philosopher's notion of rights. In either case, rights are abstracted from the instinctual drive toward self-protection as a response to aggression.

6.15.3 The revolutionary critique of rights

Revolutionary social movements of the early twentieth century advanced three main philosophical criticisms against "rights", which are still valid.

First, the "empty shell" argument: "liberal rights" (e.g., the Universal Declaration of Human Rights) are negative endowments that promise the possibility of, but do not create the conditions for, their fulfilment. Remember that in politics, rights are given by authority, administered by bureaucracy; enforced by enforcers; and managed by managers. You can encourage individuals, but only incentivize bureaucracy. Today, "rights" have become a basic issue of politics and most ["liberal"] people now believe that society needs a State in order to protect their "rights".

When we look at people's rationale for the most criminal of the State's actions, such as war, taxes, market monopolization, victim disarmament and the War on Drugs, we find that the underlying rationale is almost always "protecting our rights."

Fundamentally, "rights" are an empty shell because it is not possible to define what people do and identify why they behave in the way in which they behave based upon "rights" in any form. And hence, through a fundamental misunderstanding of causation behind human behavior and the encoding of what are essentially a set of abstractly constructed ethical dictates and exclusionary entitlements there can only remain a perpetuation of what are some very serious social issues. It is not possible to create or otherwise structure a fulfilling socio-economic environment (or a life of well-being for everyone) upon "liberal rights" and a whole apparatus for managing those rights.

Second, that any talk of "rights" in politics must be backed by an economic system that facilitates it, and capitalist individualism, commodity production and the market economy in general do not create the conditions for freedom from agenda-based thinking and the artificial manufacturing of wants. In fact, they incentivize monopolization and oppression. The claim by competitors and those who hold political power is that "rights" become an issue when individuals live in proximity with one another and need some "objective criteria" by which they can get along [because they are not capable or sufficiently responsible to get along without "rights"] -- in other words, and from their perspective, sharing and cooperative design are not possible among human social relations at any scalable level. Further, "rights" derived from a subjective (or intrinsic) notion of ethics will always become a political-legal concept [to be monopolized and modified by the State or by some other entity with power]. Rights that are given are always "under siege", and are easily taken away. The very notion of "rights" re-creates a continuous battleground (i.e., the market-State) where agenda, monopolization and oppression are spawned. "Rights" create the persistent idea that you are fighting someone [for your right].

Those who believe in the validity of the State (i.e., a "statist") generally believe that rights are more than a validation of force. When someone with such a belief says that something is a "right", s/he is virtually always implying some sort of positive spin on the subject. Statists think they are stating something about the values that society should hold. To them, we should acknowledge a "right to health care," for instance, because health care is important and should be acknowledged and protected by the State. In their belief, the role of a right is to reinforce and further positive aims. In doing so, they do their best to ignore what a right really is: a validation of the use of force.

The concrete role of a "right" is to designate when force is justified in a social context. When a market philosopher states that individuals have a "right to self-ownership," what s/he is attempting to articulate is that the individual is justified in using force to resist anyone who wishes to claim partial or complete ownership over him or her. That is the entirety of what an "individual right" entails.

We can now see that the rights and freedoms of a collectivist nature claimed by Statists, such as the "right to health care" or the "freedom from fear," can only mean fighting against the individual's rights and freedom. If we say that we should be free from fear, what does that mean? Obviously it does not mean that any single individual should be free from fear, as there are a multitude of things that people fear, many of which contradict each other (for instance, some people might fear a moralist society, others might fear a licentious society). The only monopolizing entity that can dictate what kinds of fear one must be free from, is the State. Therefore, any statement of rights or freedoms that are collectivist in nature, are statist in nature.

This would mean that "rights" cannot exist without the State. But, some might take this as tantamount to saying that a stateless society cannot exist, as a society itself cannot exist without some form of prototypical rules (as "rights" or protocols) so that individuals know how to optimize the coordination of their actions and know when a violation might result in the expression of aggression by the individual being violated. In community, these are known as "access rights" (or more accurately, "access protocols / rules"). Since stateless societies have existed and persisted successfully throughout history, we must conclude that the principle that rights are statist in nature must be wrong. Even the democratic States of today, which exist in blatant violation of "individual rights", still recognize murder and theft as grave "crimes": they simply omit to condemn them when committed by the State.

All "rights" are predicated in some way on the use of force, without exception. This basic fact is often obscured by Statists because of the bureaucratic distance between democratic action and the implementation of force by the State. Market anarchists accept this because they know rights exist in order to protect the freedom of the individual. Most people accept that one is justified in shooting an intruder because we naturally see people whose values can only be fulfilled by initiating force, invaders, as being counter to general freedom, peace and order, and therefore our own freedom and peace.

In nature, most organisms will attack and/or defend themselves when they feel threatened; humans are no different. The question is, are we organizing a society [clearly based upon competition] where individuals continuously feel threatened by one another? The continuous state of threat leads quickly to the formation of a [systematic] State of threat (or violence), a government which monopolizes violence. The formation of a "rights-based governance" system is a natural progression in any society based upon competition, in any "market economy". Then, the question becomes, are we re-encoding the idea that we need to continuously defend ourselves from others in society by reaffirming our right to protect ourselves, or are we designing a new system of coordinated cooperation to reduce competition, and ultimately, fear of others and a chronic state of fight or flight that has become so "softly" normalized in early 21st century society that all but the most sensitive perceive its existence. Regardless of the design of the socio-economic system, an individual doesn't need a "right" to protect themselves; individuals have the physical capability (i.e., effectors) to defend themselves. Individuals are self-initiating, and one of the actions they can self-initiate is the action of violently aggressive defense.

In the market, oppression never goes away, it is structurally re-enforced and continuously re-encoded. In the market there is a price for nearly everyone and anything.

Third, the "means to an end" argument: "rights" free labouring people from feudal obligations and old forms of oppression (caste, gender, and so on) and allow limited political space for organised dissent, which is not useful for its own sake, but only if people actually organise themselves to create the conditions for real freedoms. And, this brings up a fundamental question: If we need to "earn the right", then from who are we earning the "right" [to exist]? If "rights" are privileges given by authority, then there must exist a group of people with the privilege to give rights. Notice how in political philosophy "rights" quite easily become a circular issue. Powers of authority are given by "rights" and the powers in turn give "rights"; wherein, all the while a few hold the privilege of using force and coercion [where the real power behind a "right" lies]. In the market, privilege can be bought and sold. Yet, in community, no one has rights or privileges over others.

Socialist revolutions of the early twentieth century extended the philosophical critique to the political arena and removed property from the idea of "rights" and tried to infuse the idea of "rights" with positive substance, so that the right to a job meant that everyone should have a job, not just the possibility of finding a job; the right to education meant that schools should be free so that every child could go to one, and not just the possibility of education for those who could afford it, or those supported by charities. Unfortunately, they forgot to ask some very important structural questions. Most notably: (1) What is a "job" and why does everyone need one? (2) What is the difference between learning and schooling, and what does the difference mean to education at an individual and social level? (3) Who is going to pay for these "free" schools and how are they going to pay? In other words, socialist and national liberation struggles have articulated and attempted to achieve "human emancipation" and "liberation" from oppression, but not from "rights" (which they have yet to interrogate critically).

Given this backdrop, is fighting for "rights" the road to follow? To say yes is effectively to go backwards in history or to argue, as some modern-day philosophers of capitalism such as Francis Fukuyama argue, that there is no alternative to liberalism in philosophy, politics and law, the foundations of which stand on the idea of "rights". The real question then is: are we willing to concede human fulfillment and well-being to an "empty shell" of meaningless, violence derived possibilities based on the primacy of competition and property, which very few possess? Are we ready to concede that liberation from oppression is not possible because we cannot design a different socio-economic system?

6.16 Limits of statute law

Turning to law, legal theorists, following in the footsteps of the political theorists of capitalism, developed legal principles and "innovated" institutional mechanisms that sustain capitalism. The most significant legal development was the idea of statute law, by which is meant, different Acts of legislature on different social issues enforced by a court system backed by police powers. This form of law, which most people today think is "natural", as if that is how law has always been, came into existence only with capitalism, and is far from being "the way law has always been". Under statute law, each aspect of social life is cast into a distinct legislation or statute which makes it difficult to envisage the social whole (this is one of the reasons it is hard to micro-model early 21st century society). What one statute gives, another can take away. For example, a statute may provide for a minimum wage, but if prices go up as a result and cancel out the wage gains, then that is not an issue that can be addressed within the scope of the original minimum-wage legislation. A statute may grant the "right" to education, but treasury and fiscal management rules may simultaneously require cuts in spending. "Choice" then is limited to whether politicians allow budget cuts to affect the "right" to education or some other "right", like health for example.

Rights aren't rights if someone can take them away; they are privileges – they are temporary privileges. A protocol is a more neutral concept than that of "rights"; it is semantically incorrect to say that a protocol can be "taken away from someone", the protocol was not "given to someone", instead it was "designed" and someone/something "accessed" it. It can, however, be said that a protocol was "violated". Rights can also be violated, the consequence of which is the forfeiture of rights. The consequence of a violation of a protocol generally means a lack of access to that protocol until trust in the accessor of the protocol is restored (i.e., restorative justice). It may be of interest to note that in computing protocols can be designed to assign access "privileges" to users. In a cooperative system, these "privileges" do not denote governance; however, they do denote governance socio-economically competitive system. in a cooperative system they are more akin to voluntary agreement, and hence, it is more correct to refer to them as "access[able] categories". The concept category is more neutral than "governance", which implies some form of socially structured power hierarchy. One could refer to a living system hierarchy is as a "structured hierarchy", but it is an open hierarchy, and hence, it maintains structural accountability and traceability. The decision system described herein could be referred to as "governance" because of the notion of hierarchy. All systems have a hierarchy. But again, that seems imprecise because when accountability and traceability are structurally integrated into the hierarchy there exists a potential allowance for the recognition of emergence and of coordination. Hence, decisioning is a more neutral and accurate concept because it excludes the premise of the social requirement of a power hierarchy while acknowledging at a foundational level the idea that coordination may generate a decision and that decisions represent the emergence of a variable probability space.

6.17 A further consideration of rights

The notion of "rights" is inseparable from the history of "property" or privatisation of nature, resources, processes, knowledge, and so on, for appropriation, consumption and control by the powerful, who can take possession of objects by force, excluding others. Further, technology has made possible an extension of the notion of the "right" to private property. For example, water was historically attached to land rights until technology made it possible to separate water from land and deliver it across continents, a development that required legal and institutional "innovation".

While the political idea of "rights" promotes the idea of equal opportunities for all, the juridical idea rests on the foundational myth that the "corporate person" stands on the same footing as the "natural person". The size and reach of corporations today are vastly different from what they were in the eighteenth or nineteenth centuries, and make the legal myth of the corporate person an absurdity. It should also be noted that most governments are in fact set up as corporations.

Indeed, what is being discussing here is not a battle for "'rights" or "property", but for socio-economic power between owners in a monopolistic game that has sucked in most of this world and creates the state of dependence within most individuals. And, dependence fundamentally reduces freedom and is reasonably equivalent, in this context, to being under [the] control [of another].

In the global capitalist or imperialist order, the historically specific juridical relation of "rights" can be nothing other than the rights of corporations as legal persons competing against the fictitious abstract persons constructed by the discourses of private property. The debate over property relations in general and intellectual property rights in particular hinges upon these juridical implications.

This explains [in part] why the juridical notion and practice of "rights" is absolutely integral to the imperial-industrial world powers and necessary for the abstract self-expansion and accumulation of capital as against those who would like a return to "real [ecological] life". The claim that communities can benefit if [property] "rights" are allowed to resources is flawed. Such claims are often accompanied by the [disproven] statement that "rights" will protect because they are attended by duty.

Often, "rights" are claimed to be accompanied by a corresponding duty. This "duty" or "obligation" is sometimes referred to euphemistically as a "responsibility", and it essentially means that something is owed in return. Yet, because "rights" are subjective or intrinsic, the owner of the corresponding duty (or obligation, responsibility) is dependent upon subjective perspective: those who believe in the State generally agree that the State is ultimately answerable for ensuring "rights" are realized, and those who have a free-market leaning believe that each individual is ultimately responsible for ensuring their rights are realized. Herein, the free-market perspective is clearly a more empowering one. The Statist perspective leads quickly to the idea that some must suffer [the violence of the State] for the greater good of all of its "citizens". Though, in cases where people have been significantly disenfranchised and disempowered throughout their lives the State has been known to provide truly needed charity. Hence, it is wise herein to correctly identify that with the one hand it gives while the other hand takes.

Capitalism has transformed the structure of local communities. "Communities" too have become formed on market principles based on common "interests" in the market-place, and not human well-being and fulfillment. For example, a person joins a trade union because of common interest with others in the labour market, and joins a consumer organisation because of common interest in commodity prices, and joins a "water rights" movement because of interest in water, and so on. Interest-based communities [in the market] alter the character of "rights" in fundamental ways. As each interest is governed by a different statute law enforced by a different set of institutions, it is no longer possible to find institutional and legal recognition of "people-in-places", whose well-being requires the convergence of several interests.

The absence of the concept of "rights" implies either that a society is organized around different [paradigmatic] understandings and principles, or that ownership and property are not the general foundation of the society.

Fundamentally, collaboration in community is not about defending rights, but about bringing awareness of the system so that it may be changed to one of greater fulfillment.

6.17.1 Delegating rights

Now, there is the question of whether or not one or more people can delegate a right to a third that none of the initial delegates have. Logically, the answer to this question must always be answered in the negative, "No person can delegate a right to another party that they do not initially have". Yet, in truth, the very question of whether or not someone can delegate a right to someone else that the initial person does not have is something of a moot point if "rights" do not exist at all - if rights are an incorrect[ly], socially constructed notion of how the world ought to work, and yet, does not work [in said way]. Since "rights" do not exist, no one can delegate rights to anyone else [without the injection of force somewhere into the final equation]. Remember here that governance is primarily the delegation (or appearance of a delegation) of rights from one group of persons to another group (or class) of persons.

6.17.2 Property rights

> **APHORISM:** *The things you own end up owning you.*

Property rights are taken as a given, but they really are not. The fact is that property rights as we understand them are designed to further the interests of the rich minority (especially business owners). Many different ownership systems have existed throughout history, and new ones have been conceived and tried out with success.

Hogan (2001) observers,

> *"Definitions of ownership and theft tend to be thought of as straightforward, even natural. But they are not. They are, rather, the product of human decision. That decision operates to give special protection to just those types of ownership (or putative ownership) that are crucial to economic stratification... Indeed, this was the more or less explicit intent of the framers of the U.S. Constitution. As Noam Chomsky and others have discussed, James Madison viewed the property rights of the "opulent minority" as threatened by the masses, and thus as requiring particularly stringent protection."*

Now, what is the foundation of "property rights"? Where do they come from? Capitalists will give various answers to this question. Property rights allows the owner of a piece of property to decide, to some extent, to do things with the property that affect other people. Therein, private property rights include the right to use property in ways that disadvantage other people, as long as these disadvantages do not include violations of the stated rights of other people (although there is a lot of leeway here depending upon a property right holder's purchasing power in the market-state. To disadvantage someone might involve the closing of a factory to workers or the exposure of workers to a toxic environment. Individual needs involve interpersonal relationships. The very notion of a [property] "right" involves the addition of force into the relationship.

The most popular foundation is self-ownership (the circular belief that the body is a property of itself). Francois Tremblay (2013) has spent extensive effort debunking the concept of self-ownership. Essentially, proving "property rights" with self-ownership is a circular argument, since the concept of self-ownership itself is based on the concept of property.

But even if we ignore these fatal problems, how do we pass from self-ownership to property rights? It is argued that if we own our body, then we also own what that body produces. But surely this is grossly inadequate as a justification of "property rights" as they exist today; for one thing, "property rights" are routinely applied and enforced on natural resources (e.g., water and oil), which are not the product of any human body. But also, this does not address all "property rights."

"Property rights" are divided into three categories: usus; fructus; and abusus. Usus contains the rights regarding usage, such as inhabiting a house or an apartment. Fructus contains the right regarding the products of that property, such as the fruits of a tree or the crops gathered from a piece of land. Abusus contains the right to dispose of a property, such as selling, modifying, destroying, etc.

If we accept the reasoning from self-ownership, then we can make sense of usus and fructus, but not of abusus. After all, most capitalists do not believe that we have a right to sell our own body into slavery, for example. Many also do not recognize a right to suicide, especially conservatives. But if self-ownership excludes abusus rights, then how can abusus rights be derived from self-ownership? There is a logical problem here.

One may sidestep the issue by stating that the kind of ownership in self-ownership differs in category from the kind of ownership we establish with "property rights." That's fine, but then in what meaningful way are "property rights" derived from self-ownership? Logically, the fact that one owns one thing does not imply that one owns, or even can own, anything else. So, self-ownership in itself doesn't logically imply the concept of property.

One may then reply that self-ownership does imply property because we need property in order to survive [in the market]. We need food, lodging, cleaning, and so on. We must, or so goes the argument, hold things as our property in order to use them in these ways. We have a right to life and, in order to maintain that life, we need "property rights." Remember, capitalists perceive most (if not all) of social and economic existence through the lens of property.

But again, this does not prove all "property rights." You can hold and use an apple without selling it or destroying it (that is to say, making it unusable). You can live in a house without selling it, modifying it significantly, or destroying it. So again, abusus is not proven here, and it is a necessary part of "property rights."

Not only are "property rights" not needed to affirm any right to life, but "property rights" are at tension with the right to life. Nowhere is this shown more clearly than in the contradiction between the "property rights" of the pharmaceutical industry and the "right to life" of people in the Second and Third World. (Shah, 2011)

Consider that "property rights," by their very definition, are an absolute limit over the implementation of all other, real rights. Basically, the right to life is meaningless without the right to health [care] and other life necessities, that the right to assemble is meaningless without a place to assemble in, that the right to free expression is meaningless without the tools of that expression, that the right to justice is meaningless without the means to be treated as an equal, and so on. All "negative rights" necessitate "positive rights" to be meaningful at all, including material ownership. And, "property rights" make it so that this material ownership is contingent; it is contingent upon a multitude of factors: who you were raised by, the kind of education and work opportunities available, and so on.

Not only that, but "property rights" also dictate how this material ownership becomes concentrated into a small number of hands. The two biggest influence on this are (1) the lack of limits on the amount of land or property one can acquire (so that one person can buy more than his "equal share") and, (2) most importantly, the private ownership of the means of production, by which the owner can extract surplus value from his/her workers (i.e., "profit") with the help of the extensive structural crippling executed by the State. But this is not new; for centuries, "property rights" have explicitly been used to protect the moneyed minority against the anger of the destitute majority (when they talked about the "rights of minorities," they were talking about the rich, not black people or natives or Irish, who were considered subhuman).

If a small percentage of people have most of the wealth (in the US, the top 1% controls 35% of the wealth and receive 20% of the income, while the bottom 80% controls 15% of the wealth and receives less than 40% of the income; the picture is less dramatic but similar in other Western countries), and we live in a society where wealth determines material ownership, and by extension rights expression, then we should expect such a society to be stratified, and for some to have more rights than others. Furthermore, we should expect many in the bottom strata to have very little to no rights at all.

Note that it does not matter what the power elite claims is the case. We are told that all citizens have equal rights (never mind so-called "immigrants" and children, because they still aren't considered fully human). Yet in practice, we know this is false, to a large extent because of material inequality within countries and around the world.

Since people must fight against "property rights" to maintain their livelihood and their dignity (as the Zapatista and other indigenous people have clearly demonstrated), there cannot be such a thing as "property rights." A "right" which supports aggression against other people's rights is not a right at all.

The legitimacy of "property rights" is only maintained by the pretense that because anyone can, in theory, own property, therefore "property rights" are egalitarian. But this is incredibly flimsy grounds on which to exploit and oppress people. Anyone can, in theory, become a CEO; does that mean corporations are egalitarian? Anyone can, in theory, win a fistfight or a duel; does that mean "punching rights" and "shooting rights" are egalitarian? Anyone can, in theory, write a novel or produce a song; does that mean "IP rights" are egalitarian? Anyone can, in theory, follow "the right god"; does that make religion egalitarian? Anyone can, in theory, be a perfect parent; does that make the child-parent relation egalitarian? "Property rights" are not only not egalitarian, but they are the primary source of inequality, and therefore of unfreedom. It can be well argued that all hierarchies are a form of property. (Tremblay, 2009)

> **NOTE:** *Design [in community] represents an opportunity. Rights represent a static relationship.*

6.17.3 Property rights and freedom

Capitalists believe that property is the bulwark of freedom, and that the uniform application of property rights can only bring about mutual respect and secure outcomes. As Proudhon points out in What is Property?, this was most probably true in the beginning, where presumably most people had a plot of land to cultivate and were thus secured by the unlimited control granted by property rights, but it is not at all true today because of the unforeseen consequences of such arbitrary rights [at scale]. As Proudhon discusses in "What is Property":

> *Agriculture was the foundation of territorial possession, and the original cause of property. It was of no use to secure to the farmer the fruit of his labor, unless the means of production were at the same time secured to him. To fortify the weak against the invasion of the strong, to suppress spoliation and fraud, the necessity was felt of establishing between possessors permanent lines of division, insuperable obstacles. Every year saw the people multiply, and the cupidity of the husbandman increase: it was thought best to put a bridle on ambition by setting boundaries which ambition would in vain attempt to overstep. Thus the soil came to be appropriated through need of the equality which is essential to public security and peaceable possession.*
>
> *They did not foresee, these old founders of the domain of property, that the perpetual and absolute right to retain one's estate, — a right which seemed to them equitable, because it was common, — involves the right to transfer, sell, give, gain, and lose it; that it tends, consequently, to nothing less than the destruction of that equality which they established it to maintain. And though they should have foreseen it, they disregarded it; the present want occupied their whole attention, and, as ordinarily happens in such cases, the disadvantages were at first scarcely perceptible, and they passed unnoticed.*

The history of this degeneration can be understood in Kevin Carson's (2007) "Studies in Mutualist Political Economy, Part 2", which is a detailed historical analysis of, amongst other things, the progressive seizure of the commons in the name of property. His conclusion can be stated thusly:

> *Capitalism, arising as a new class society directly from the old class society of the Middle Ages, was founded on an act of robbery as massive as the earlier feudal conquest of the land. It has been sustained to the present by continual state intervention to protect its system of privilege, without which its survival is unimaginable. The current structure of capital ownership and organization of production in our so-called "market" economy, reflects coercive state intervention prior to and extraneous to the market. From the outset of the industrial revolution, what is nostalgically called "laissez-faire" was in fact a system of continuing state intervention to subsidize accumulation, guarantee privilege, and maintain work discipline.*

6.17.4 Access rights-control system

Access rights aren't "rights" in the sense of property and authority (self or other). They are more akin to technical rules, or even more accurate, "protocols". They are more related to say "rules of evidence" than ethical prescriptions. They are not entitlements. Access rights are not given by authority, nor are they intrinsic to biological form. They are formal protocols with an emergent description of our access-oriented relationship toward common heritage resources and the technological services into which they are composed. They are not "rights" per say because they are not something granted to you or something inherent in you. Effectively, they are technical descriptions of optimal coordination and safe operation. If they are "violated" there is not punishment (i.e., they are not punitive in form or structure). Instead, when "violation" occurs [for a causative and discoverable reason] there is inquiry into how the violated relationship may be restored and how the system may be restructured so that the incentive to violate is less likely. Also, whereas rights are given and taken away, access protocols are formally designed, contributed to, and changed when a preponderance of evidence indicates a requirement to do so.

The access protocol system represents a simple and concise rule system for clarifying the access of system resources, goods and services. And, it is also a system that reinforces healthy forms of social interrelationship. Notably, the system is not centered not upon the notion of "property rights" and punishment, but "access rights". As such, each "access designation" comes with a set of access protocols (a.k.a. "access rights" or "access rules").

Imagine a scenario where an individual parks his or her bike on a street, without a lock, entering a house. Then, a bystander, who is in a hurry, not close to a distribution library, sees this bike and makes an inappropriate decision to take the bike to get where he needs to go [in violation of the other users temporary, but current access right to the object]. This is a dishonest and rude act. This action by the bystander is "in violation" of the common "personal access" protocols "governing" the items use, but most importantly, it is "a violation" of another individual's trust. Notice how this isn't a violation of any sort of property relationship, but it is a violation of a commons-oriented trust relationship to access. In a property system, this would be called "theft" and there would either be punitive damages and/or restitution [to be paid] ... and the individual who committed the theft would have the incentive not be "caught" [by the authorities]. In an access system there is not "theft", but there is a violation of another's access. The "severity" of the action is very different -- it is more of an annoyance than a crime. In a property system the bike would likely be sold for money or kept (or even destroyed if the perpetrator wished to keep the action entirely hidden). In an access system, the original user would simply obtain a new bike and move on, though inconvenienced; while the person who took the bike would likely just drop it off after use, as there is no resale value and hence no real reason to keep it or destroy it. Fundamentally, the behavior of the rushed individual does not prompt the defensive use of force and protection by the original accessor of the bike for s/he can acquire the same one or another one in the future, though it may truly inconvenience him or her in the moment.

It is important to note when speaking of access protocols that the uncoordinated use of a potentially dangerous service is a serious risk to others using that services. For example, drinking and driving is a serious risk to others using the highway. Also, the operation of some service objects requires training in order to operate the object safely in a common environment -- as in, training to drive a car prior to its operation on a highway transportation system (i.e., in conditions that require knowledge and refined coordination). The uncoordinated use [either through intoxication or insufficient training] of a potentially dangerous service system could be catastrophic.

It could be said that an item "rented out" in this system is given "legal status"; and yet, the term "legal status" somehow does not accurately reflect the design of the access protocol system, which is not so much indicative of a state-of-protection[ism], but of a system of safe and coordinated usage (and participation) -- safe access.

Access protocols aren't about the protection of someone's or some society's value expression, they represent the emergent parallel design of access between individuals for optimal coordinated cooperation.

6.18 Property-oriented to access-oriented thinking

> **INSIGHT:** *All that is common heritage belongs to all generations of humanity to be held in trust by the living generation.*

There is a world of difference between the structural behavior of a distributed and coordinated [designed] access system and a property-oriented system, which has encoded the exclusively protected right of owned possession, and gives rise to [market] economics and political law. Whereas, an access-oriented system only recognizes and encodes the coordinated and designed access to common heritage resources for the purpose of fulfilling the common needs of individuated embodied consciousnesses.

We can either get together and socially construct the idea of property and continuously relive the host of consequences that accompany it, or we can acknowledge and encode the universal term, 'access'.

An access society is very different from a propertied one in many profound ways, especially when it comes to sustainability, a value orientation toward well-being, and human behavior itself.

A true abundance-generating efficiency mechanism is to be found in a systems-orientation, which distributed access entails. It is emergently uncovered while accounting for the synergy present between the sustainability laws inherent to the natural world and the level of efficiency incorporated within the entire societal operation.

The Community seeks to create 'access' abundance, not 'property' abundance, whatever that might mean. It exists as a commonly accessible and coordinated platform for facilitating a means of access, where goods and services are designed and shared in an integrated manner such that more individuals gain more access to goods and services they would otherwise not have the purchasing power to acquire in the capital market economy, and with less resource consumption and less production, in proportion.

The Community is a functional service system designed by its own users to provide a maximum of access to goods and services to everyone in the community given what is known. In its social form it represents a potential of opportunity rather than perpetual inequality. This is the position of a community's "social safety net" -- it is not "guaranteed minimum wage", but "maximized sustainable access to services through resource coordination and cooperative design".

Sharing and the philosophy of "property rights" are not capable of being co-joined. Sharing implies voluntary, and when the authority says you have to share it appears more like surrender to the person having to give up that which they are playing with. Further, forcing individuals to relinquish that which they are playing with is not a healthy form of "de-centering". When we are more secure in our own being and our own selves that leads to empathy and space in the mind for the needs of others building compassion through understanding.

In the market there is little to no "high standard" (Read: high quality-of-life) safety net for most people or for their property. In the market, if you don't have the money to repair "your property", then it is "junk", there is no community value or requirement to help. A major step forward toward a global community of this form would be for businesses to provide an unlimited warranty on their products with unlimited updates for set number of years after purchase, a decade or so – this would in turn incentivize them to produce products with greater durability and modularity. Yet, at a fundamental level, primarily due to the competitive cost-efficiency drive underlying the market, there is no allowance for the creation of durable and integrated service systems.

In the market property defines the person. Yet, in reality one must ask, "Why do I need to own a car, for I just want to use it?" Yet, in truth, even "access" to a car doesn't go far enough; a car is part of a transportation system, and without roads the car is reasonably useless. Hence, and more precisely, someone might say that they want access to an efficient, sustainable, comfortable and functional transportation network that includes a form of convenient personal/family transportation (which represents a more clarified "access demand"). Hence, in community access is what defines individuals if they so choose to be defined – access is what defines one's relationship to the quality and consistency of the type of access (e.g., transportation) that individuals know is possible and desire. And herein, it is possible to begin seeing the sense of integration characteristic of a community.

6.18.1 Access and not property

Property is not an empirical concept, only 'access' is, as well as its connotation 'use' and the connoted corollary, 'possession'. In nature, there is no real "property" or "ownership", these are human constructs and are not a reference to an existent relationship in the real world. In other words, "property" and "ownership" do not actually exist, they are illusions, albeit persistent ones. To more fully clarify this point, the study of semiotics must be brought into discussion here. Briefly, semiotics is the theory and study of signs and symbols. When embodied consciousness holds something, eats something, maneuvers something or interacts in any way with object[ive] material that is accessible (Read: possible to form an interrelationship with) from an environment, then an observer sees the body accessing the object (i.e., denoted, expressed signifier) and thinks of the body as "using" or otherwise "possessing" the object (i.e., connotation, signified) for some temporary duration of time. The body coming into relationship with the object experiences "access" [to the object] and conceptually thinks of "use" of the object (if the access is conscious and not sub-conscious, such as breathing). In other words, consciousness identifies the existence of objects in the real world through perceptual and experiential access [for purposeful function].

What exists is more akin to "access[ability]" and "usership", and when someone is using an accessed item then the abstraction "possess" may be used to describe their "possession of it". The ideas of "property", "ownership" and "rights" do not denote the identification of existent relationships, they connote a whole set of subjective abstractions with serious and life altering consequences.

The concepts of "property", "rights" and "ownership" sub-compose the market and the State, which are [socially constructed and accepted] illusions also. In the real world an entity accesses and uses things, and it does so both spatially and temporally. Neither "property" nor "ownership" maintain an objective spatial or temporal nature; as they are subjective concepts their encoded nature is that of "privilege" [given or taken]. People in a market-state have the privilege to appropriate objects for some "rightly" given or taken duration of time enclosed in another "rightly" given or taken boundary, and defended by the [validation of] force. When "spatiality" and "temporality" are applied to "property"

"Property" is an invention by man; there is no objective platonic definition of what property is. It is a human construct established by legal terms and an enforcement mechanism based upon violence. "Property" and "ownership" are subjective; they are not real processes or activities anyone is capable of performing. This is why there is a lot of theatrics and dramatics in the legal world, and obfuscation in the economic world. The legal world relies on perception management and requires the appearance of something tangible, hence the theatrics; the economic world also relies on perception management, but it does so principally through obfuscation and "syntax destruction". Note that in semiotics, "syntax destruction" refers to the removal of identity from the model by which consciousness may come to systematically understand the existent, and hence, re-orient itself toward a direction of fulfillment. Syntax destruction decouples concept formation from the signal form, the signified from the signifier. After which all existent meaning is lost and anyone can read anything they subjectively want to into the signified. And, the media play upon this meaninglessness to create spectacles and feed on disasters. The resulting effect of dissonance of thought is the negation of nearly all systematic, critical, and scientific thinking processes, and potentially even aggression toward them when they seek to point out the contradictions. (*Alan Greenspan's*, 2020)

An individual cannot empirically be said to "own" anything. At best, all you can say about ownership is that "this is in my possession now and as long as I am using it". That is the most 'ownership' there is in the real world.

Everything that anyone claims to "own" is only theirs temporarily, and while in the market, it is only spatially theirs while they can stop competitors from taking it. The concepts of "ownership" and "property" (as well as "authority") are what has made it possible for a few in this world to own a whole lot.

In truth, everything is only "borrowed" (or, to use a market-term, "rented"); this is even the case with corporeal form. Food goes into you and comes out again; so does water. Even your body is on "loan" (again, another market term). When you die the body goes back into the circulation regardless of any "infinite wants" you may have had prior. Ownership is an illusion. Still, it's an illusion bought by most of humanity that gives some the right to claim vast resources of the planet for themselves, while others get nothing.

Fundamentally, there is no ownership in nature. There is only coexistence, with every part fulfilling their task, and every part being fulfilled in doing so. This is how community looks at ownership, since this is the only "ownership" there is and ever will be.

No one can look at an inanimate object and point to some non-physical cord that ties it to its owner through some intrinsic, invisible relationship. But, you can point to a living thing and percept its access to and usage of inanimate objects. In other words, you can't look at some random non-living object and say, "look, I can see that it is the property of so and so", or "look I can see in it (i.e., some intrinsic characteristic that assumes property delineation) that that person over there is its owner". In brief, an empirical concept is solely based on observation and experience, and "property" and "ownership" and "rights" are based on neither.

Now you know the basic building blocks of the monetary socio-economic capitalist system. Property is a protectionist contrivance. Access is the reality of the human-social condition. In order for one to truly "own", say, a computer, one would have had to personally come up with technological ideas that made it work, along with the ideas that comprise the tools of its production. This is literally impossible. There is no such thing as empirical property in material reality. There is only access and sharing, no matter what social system is employed.

Today ownership is almost equal to accessibility for those with the greatest purchasing power. The more someone owns, the more access s/he has to things in life. The larger social problem is that each individual is only one person and cannot possibly make 100% use of all the things s/he owns. And, on a finite planet with finite resources for everyone to own one of everything they [are manufactured to] want is pure folly.

Not owning anything is a notion built on the opposite of scarcity, abundance regeneration. It is a thought that when we share in a coordinated manner then everyone will have many times more than what we would ever have if we were to own everything we wanted.

The terminal point is that when you die or when you give something up, it is not yours anymore. Sure, you can "hold on to it" and "control it" for as long as you can. You can lock it up, rent it out or use it yourself. This is how the monetary system and mindset works. That doesn't mean that you own whatever you think you own. It is merely a loan, as all in this world is temporary. That goes for territorial animals in nature as well. When they're done defending "their territory" it is not "theirs" anymore, and one can well argue that it never was. They only had it on a loan from nature.

> **INSIGHT:** *If you didn't own anything, but had access to virtually everything the Community could offer, you would "own" more than the richest people on the planet will ever own.*

6.18.2 Utility and ownership

Let us ask ourselves, is utility derived from owning something or is it derived from using it? Do you want to own the Ferrari or drive the Ferrari? Do you want to own the shoes or wear the shoes? Do you want to own the music or listen to the music? When you think about it, all the enjoyment and fulfillment from material things comes from using them, not owning them. Owning something requires you to clean, maintain, protect, replace, discard, buy, and sell it. Using something requires you to, well, use it and, of course, care for it while it is in your possession. Even in a market, renters have far higher rates of resource usage efficiency (i.e., economic efficiency) than owners – a rented DVD is watched far more times than a purchased DVD.

Less ownership = less individual expenditure of energy in maintenance (i.e., more freedom) and less conflict in the fulfillment of needs (i.e., more justice).

In an access-orientation there is not rivalry, and resources are accessible to the community in respect to their use. In community, no matter your access you cannot "own" or prohibit the use of any good while you are not using it.

6.18.3 Cults and access control

> **INSIGHT:** *All political systems are embedded in a cult~~ure~~. All technical systems are embedded within another technical system. All human systems are embedded within a socio-technical system.*

A set of understandings based on science is characteristically emergent in form. In science there are no accepted truths or ideologies to cling to and there is nothing which is considered sacred. Like the claims of "utopianism", the truth regarding the community system described herein is that it is literally the opposite of a cult. A cult implies a fixed worldview where certain ideas are deemed right and true [without evidence or reason], and some level of [structural] violence or manufactured suggestibility exists to sustain the cohesion of the group. By simple definition, any social system using secret organizations (a.k.a., secret agencies or private institutions) is a cult, because it [oc] cults (i.e., hides) information from the commons, and/

or has an incentive to do so. Anything that is hidden or secret is occult (i.e., a cult).

> **INSIGHT:** *A cult [leader] controls the decisioning of the followers.*

Cults are frequently defined a high-control groups. In other word, cults are groups in which the members are highly controlled. There are four basic ways to tell whether a group is a high-control group (the BITE model; Hassan, 1990):

1. **Behavior control (B)**
   A. The organization tells you where, when, and how you can live your life. This often extends to clothing, who you can reproduce with, what you can eat, and hairstyles, etc. The organization tells you who you can and cannot associate with.
   B. The extrinsic motivators (behavior modification techniques) of reward and punishment are used to ensure compliance. This is often accompanied by the need to report thoughts, feelings and activities to superiors.
   C. Many times there will be a deprivation of sleep which keeps people in a more suggestive state.
   D. A simple question to ask about a group in concern to behavior control is, "What will happen to you if you leave the group?" Will you lose all of your former friends, will you potentially be killed, is there any nice way to leave? In high control groups, there is no nice way to leave. Individuals who leave are often subjected to shunning, will lose your members and friends, and may be harassed or persecuted.
2. **Information control (I)**
   A. In order for a high-control group to survive it must control the information its people are getting. Anything that talks about the group that is outside of the control of the leaders is censored, forbidden, and/or deleted.
   B. High-control groups often use confessions unethically.
   C. Cults control individuals by claiming they have the truth and denying access to knowledge.
3. **Thought control (T)**
   A. The organization promotes an enemy-type mentality (Read: us versus them, polarized mentality). For example, "You are either for us or against us; you are either good or you are evil. Here, there is no gray area, spectrum, or contextual complexity. You are either good and amongst the righteous, or you are evil. There is no in-between ground.
   B. The group will try pre-program individuals to avoid hearing critical thoughts by teaching them "stop thought" techniques (a.k.a., thought stopping techniques). These techniques are designed to get members to close down and ignore critical and negative information about the group. Hence, if a member is confronted by someone who has information that is critical or negative about the high-control group, then the group members are taught techniques that cause them to close down and shut out that information. Often, the high-control group will encourage members to only have good and proper thoughts, and if a bad thought enters your mind then you stop yourself from actually thinking that thought (e.g., labeling it negative) and/or punish yourself.
4. **Emotional control (E)**
   A. Any emotion that doesn't support the group is deemed wrong or selfish.
   B. The group will teach emotion stopping techniques. For instance if someone feels doubt, uncertainty, homesickness, or anger, they will teach the member how to stop those emotions. The group will teach you to feel less than, like you are at fault; the group is never at fault, and the leader is certainly never at fault. If a member senses there is a problem with the group, it is always the individual's fault. If someone senses there is a problem somewhere in the organization, it's due to their own faults and problems. If someone complains about anything or criticizes anything the group will label the individual as having negative thoughts, they might even turn on the individual and say, "What problems (crimes) did you commit against the organization to make you think that way".
   C. Guilt and unworthiness are a big part of high control groups. Guilt is the one emotion that high-control members feel on a regular basis. High-control groups often seek to promote fear in their members, or they use fear for emotional control.

> **INSIGHT:** *To organize a cult, first, identify a passable belief and give it to the people. Simultaneously, put them under authoritarian leaders. Also, give them a special jargon, and a uniform. Sleep deprive them. Separate them from their families.*

There are ways in which organizations can become corrupted such that they rapidly re-orient toward dogmatic and punitive behaviors. In an effort to describe a society that is organized around an objective set of integrating factors it is necessary to describe how said society is neither perfect nor an ultimate conception of what could be. What is possible now is what is contributed to be available.

> **WARNING:** *If you have a friend in a high-control group, then be very careful about criticizing the group. Members of such groups are usually trained to shut that information out and shun the person conveying it. Instead, just be there for them when they need you. If they seem receptive, ask though-provoking (epistemological) questions that might help them realize for themselves the logical inconsistencies in their belief system.*

The people who are immune to the influence of a cult (high-control group) usually fall into one or more of the following categories.

1. They care nothing about improving themselves in any way.
2. They have no desire to help others.
3. They seek to eliminate (using any number of methods) all beliefs from their mind, such that they remain continuously open and critical of new information. When new information is presented they seek to integrate it in a non-contradictory way.

In general, cults have at least some combination of the following characteristics:

1. Cults maintain high social control (often substituting authority for certainty of human need fulfillment).
2. Cults seek loyalty to their leaders.
3. Cults suppress information.
4. Cults have fixed beliefs.
5. Cults do not express care, compassion and understanding.
6. Cults can only see what they see; they cannot see what you see, either because that information is blocked by the cult, or the cults belief system prevents understanding.
7. Cults may isolate members and penalize them for leaving.

Cults have leaders who control their followers (the "masses" or "citizenry") and feed on their psyches, emotions, and sometimes, productivity. Cult leaders want [highly] suggestible and "programmable" people. Generally, a cult is an organization with some kind of religious, ritual, or dogmatic overtone that attracts, forces, or indoctrinates people into adopting a certain set of ideas or practices [that society at large deems abnormal]. Therein, cults either restrict their members ability to seek outside information or they force the continued acceptance of its ideology. Sometimes a cult involves worship in matters of faith as that which is stated as absolute, without facilitation of verification for the self. In a sense, a cult becomes an extraction of effort in the form of faith over conscious self-verification.

In a [cult]ured society there is great emotional pressure not to realize the cult. All the time sunk into the cult, all the energy and friendships, all the personal connection and social traditions, all the rituals and dogmas, all the training and rewards.

Conversely, the purpose of the social system described herein is to create a human life system, a society, designed to continuously improve and adapt for the mutual benefit of everyone's fulfillment. The Community described herein involves a constant and ever changing set of information models that are participatively developed and collaboratively applied. Fundamentally, forming anything on the basis of a cult makes very little sense in terms of human fulfillment.

One might still argue that this social system [design] is a "cult" in that it encourages the spreading of abnormal ideas; however, if that is the case then literally, every person who is attempting to change the way the world works in any way is some kind of "cultist". What we considered abnormal is a continually changing definition that varies greatly depending upon location and time and person, on context. For example, it was once considered normal for people to move from continent to continent on ocean going ships. If we are going to refer to anything abnormal as a cult, then the Wright brothers would have to be considered cultists for their work toward the development of an airplane. The definition of the concept, 'abnormal', is simply too variable to be a logical basis for judging what is and is not a "cult".

Also, there is the all-important notion that a cult must attempt to brainwash people into believing that certain things are absolute and unchangeable truths. This is generally done in two ways: 1) force people to only consume one set of information, or provide information from one divided source (e.g., bi/poly-partison governmental politics); or 2) consider one set of information as being right, and discourage anyone from seeking outside information (i.e., all-source information).

Cults attempt to prevent their adherents from seeking outside knowledge and they maintain an environment where they must rely on the teachings the cult pedals. Effectively, members of a cult are restricted or somehow inhibited from accessing other sources of information. The last thing a cult wants is for individuals to discover things for themselves or to question the teachings. Hence, a cult would not make the following statement:

These blueprints have been written by individuals who seek to think for themselves and we strongly encourage you to do the same. If this really were a cult; clearly it would not be a very robust one. No cult can survive by encouraging potential converts to seek outside information and think for themselves. Instead, cults stifle dissent, often by applying a rigidly presumed "oneness" of mind (often policed in some form). And, they regularly structure their environments so that their followers maintain a state of hyper suggestibility.

Fundamentally, the approach (previously defined) taken by this social system encourages "you" as an intelligent human being to acquire and employ "your" own abilities to critically think and resolve contradiction in determining whether or not anything stated here makes sense. This approach is not one of force. In the Community we do not force anyone into accepting certain ideas or truths. If anything, we are expending effort so that others begin to ask more questions and become more skeptical of the world around them. We seek to look at the world rationally (as a set of discoverable and understandable relationships) and come to a common conclusion. We seek to understand reality, not to homogenize a mental abstraction of reality.

A fulfillment-oriented community must be designed to facilitate individuals in becoming as independent as possible in respect to researching, analyzing, and verifying information - independence in access. There is no reason why information about the system should be concealed, for such an action would make life harder for all users of the system. The social-economic-political pressures of early 21st century society that push us in conflicting directions on a daily have a tendency to cause us to be in a state of relatively static social homeostasis, or in other words, a state where we don't really want to change our behavioral patterns even when they might not be serving us. By providing individuals with an ability to navigate in a complex environment they then have the responsible option to act in accordance with what they think is optimal, and not what the cultural homeostasis has conditioned (or inflicted) upon them. As a consequence, someone is more likely to become "immune" to the detrimental practices of the cult.

Unfortunately, the structural fabric of the early 21st century socio-economic system has a tendency of generating emotionally reactionary and chaotic biophysiological robots devoid of reason and conscious self-direction. Therein, money buys you your own set of rules. Alternatively, the approach herein, particularly the actualization of the systems methodology, provides consciousness with another view, essentially encoding a means of "acting sensibly" toward events in our lives.

> **QUESTION:** *What is being cultured? Is society culturing cults that prey upon individuals or a culture that regenerates nourishment and fulfillment? What biological structures (e.g., microbes) and mental structures (e.g., values) is society culturing?*

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TABLES

Table 2. Decision System Classification: *The three decisioning processes in early 21st century society and their relative equivalences in community. Note that the three processes do not align exactly [due to a different direction, orientation, and approach] between early 21st century society and community. It may also be relevant to note that "decision making" is a key concept in "human management". Fundamentally, among community, we want to fix problems, we don't just want to advance decisions along some bureaucratic path.*

Decisioning in Early 21st Century Society and in Community			
Decisioning category processing name *(In early 21st century society)*	**Associated description** *(In early 21st century society)*	**Name given to [subjective] processors** *(In early 21st century society)*	**Descriptors given to equivalent system-level processes** *(In a community-type society)*
Making *(the decider, the maker the owner, the leader)*	The individual(s) who make a decision	(State terminology) - Leader; politician; minister; statesman/woman (Market terminology) - Executive; manager; boss	The transparent, parallel, and collaboratively developed **decisioning system**
Administering *(the administrator, the employee, the enforcer)*	The individual(s) who carry out the decision	(State terminology) Bureaucrat; administrative official; assistant (Market terminology) Administrator; secretary; employee;	Interdisciplinary and collaborative systems teams and associated **operational processes**
Adjudicating *(the judge)*	When decisions have not been "properly made"	(State terminology) Judge (Market terminology) Owner or employer; legal professional (attorney/advocate)	Transparent **feedback** and **system redesign** via integration and planning; the **restorative justice** process

Table 3. Decision System Classification: *The four transactional frameworks.*

Four Transactional Frameworks		
	Market-Based	Non-Market
Decentralized	Price System (1)	Social Sharing; Strategic Distributed Access (3)
Centralized	Ownership "Capital" Hierarchy (2)	Governments; Protocols (4)

Table 4. Decision System Classification: *The Market Economy in comparison to a Resource-Based Economy.*

Market Economy	Resource-Based Economy (a living systems economy)
Consumption	Preservation
Obsolescence	Optimum Design
Property	Access
Infinite Growth	Steady State
Competition	Collaboration
Labor for Income	Mechanization
Scarcity/Imbalance	Abundance/Equality

Global Parallel Decision Resolution Inquiry

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Version Accepted: 1 April 2024

Acceptance Event: *Project coordinator acceptance*

Last Working Integration Point: *Project coordinator integration*

Keywords: parallel decision system, resolution decision system, solution decision system, decision system protocol, societal decision system, societal decisioning, societal protocol, societal decision protocol, societal algorithm, societal decision algorithm, societal decision space, societal resolution, cybernetic intelligence, decision inquiry, decision resolution, societal decision method, societal decision procedure, societal decision thresholds, macroeconomic calculation, global access decisioning, micro-economic decision event system, global governance, economic governance, economic decisioning, socio-technical decisioning, global societal decisioning, decision system protocol,

Abstract

A society may formalize by means of an [learning] algorithm the procedure by which societal-level decisions are expressed and resolved as issues. The decision system for a community-type society applies to the Real-World Community Model a procedural algorithm to incoming social information, which generates within the decision resolution environment a solution to material and information reconfiguration. Herein, all decisions in the societal information system are seen as issues, or potential issues. These issues are processed by means of an openly sourced protocol and accompanying algorithm(s). In a community-type society, issues for an information circuit. Issues are recognized and a risk determination is applied. Issues that require changes to previously configured aspects of society go through a transparent parallel inquiry process where inquiries and designs are resolved into changes enacted upon by teams and working groups. Each inquiry process is a condition for the acceptance of a decision solution. The parallel inquiry process maintains a set of value oriented inquires for ensuring alignment of a potential solution with the actual objective. The second dimension of the parallel inquiry process is that of solution engineering to design the actual solution, which is evaluated against a set of values within the first dimension. Herein, it is from feedback upon decisions that the whole self-integrating system adapts and intentionally develops.

This decision system contains a visual issue inquiry resolution protocol with a set of parallel and interdependent inquiry sub-protocols. Herein, there are alternative uses for available resources, and there are alternative ways of making resources available. All decisions are arrived at through prior planning, and all coordinator-level decisioning involves plans.

Graphical Abstract

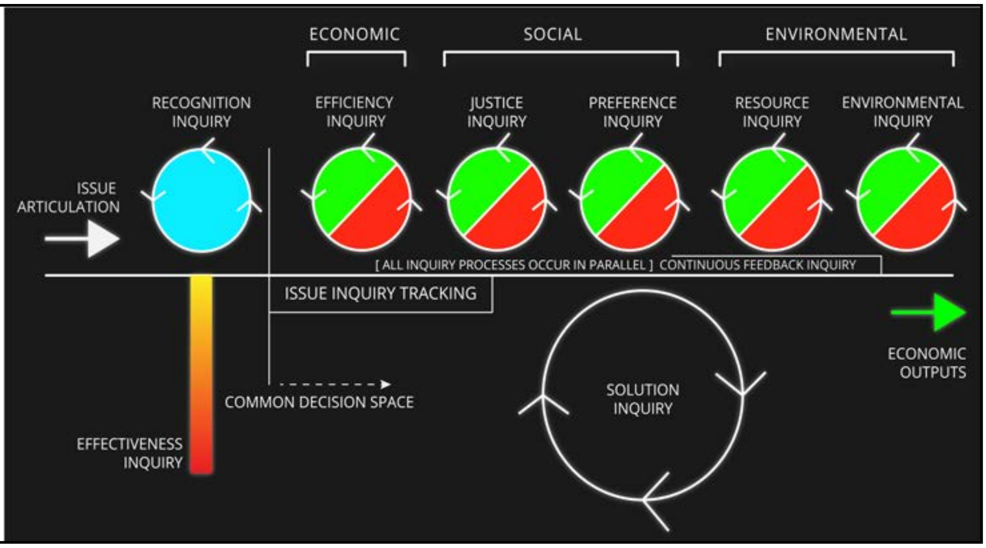

Figure 20. *Depiction of the decision system threshold inquiry processes. This is a decision space where issues are articulated and solutions are resolved, whereupon a solution is selected for team/technician operation. Safety procedures exist herein. Here, values become encoded into the operation of society through their respective threshold inquiry processes. All societal-level algorithms and economic/ resource calculation occur herein.*

1 Decision accounting and inquiry

A.k.a., The economic decisioning systems model, the decision system, the decisioning system, the kernel [for information coordination and decision support], a solution orientation to decisions, information-construction decisioning.

This decision system represents the explicit formal process by which all economic resource [transport] decisions are arrived at within the community. Together, we arrive at decisions that concern the allocation and distribution of resources toward community "demand issues". As such the system is designed to facilitate specific adaptation to an explicit demand given a set of resources and discoveries. Herein, logistical decisions are arrived at via a set of integrated systems processes which involve multiple layers of inquiry (or enquiry), input, output, and processing. This decision system model provides a common set of criteria that everyone across the organization can use to evaluate decisions and planning. Note that this model is sometimes, though rarely, called a, "strategic filter"; because, it is a high-level (strategic) filter for actions and states that are highly likely to benefit community (Read: meet community objectives/requirements). Together, the common decisioning space produces new [inquiry-resolved] solutions for integration into operational service as a modification to material [habitat] environment.

As a type of system, it would not be accurate to refer to this [economic] decisioning model as a single entity, human or machine, for economic issues applied to this model involve a spectrum of human and technological system inputs, outputs, and processes -- there is an identifiable layering to the model. This economic decision system represents the process of [multivariate] parallel inquiry into a potentially existent environmental system (an optimal solution to issues). This system includes a set of interdependent inquiry resolution protocols.

The decisioning process herein involves multiple parallel sub-processes (inquiries), where each sub-process must independently take a decision contributing to the overall decision of the system (to accept or reject a solution to an issue). For the final decision to be determined, every individual sub-process must reach its own threshold of acceptability regarding the proposed final solution. In other words, this decision system has multiple parallel sub-processes and each sub-progress must take a decision for the whole system to take a final decision and resolve the issue. Each inquiry process has a threshold decision to take as to whether or not the final solution meets its threshold of acceptability for a final solution. Each inquiry process informs an adapted (hence, adaptable) master habitat (local and/or regional) master plan, and the engineered solution (i.e., master specification plan) adapts to the deliverables (outputs) of each decision sub-inquiry process.

Each inquiry process is an rule-based acceptance condition in the decision system. Each inquiry seeks

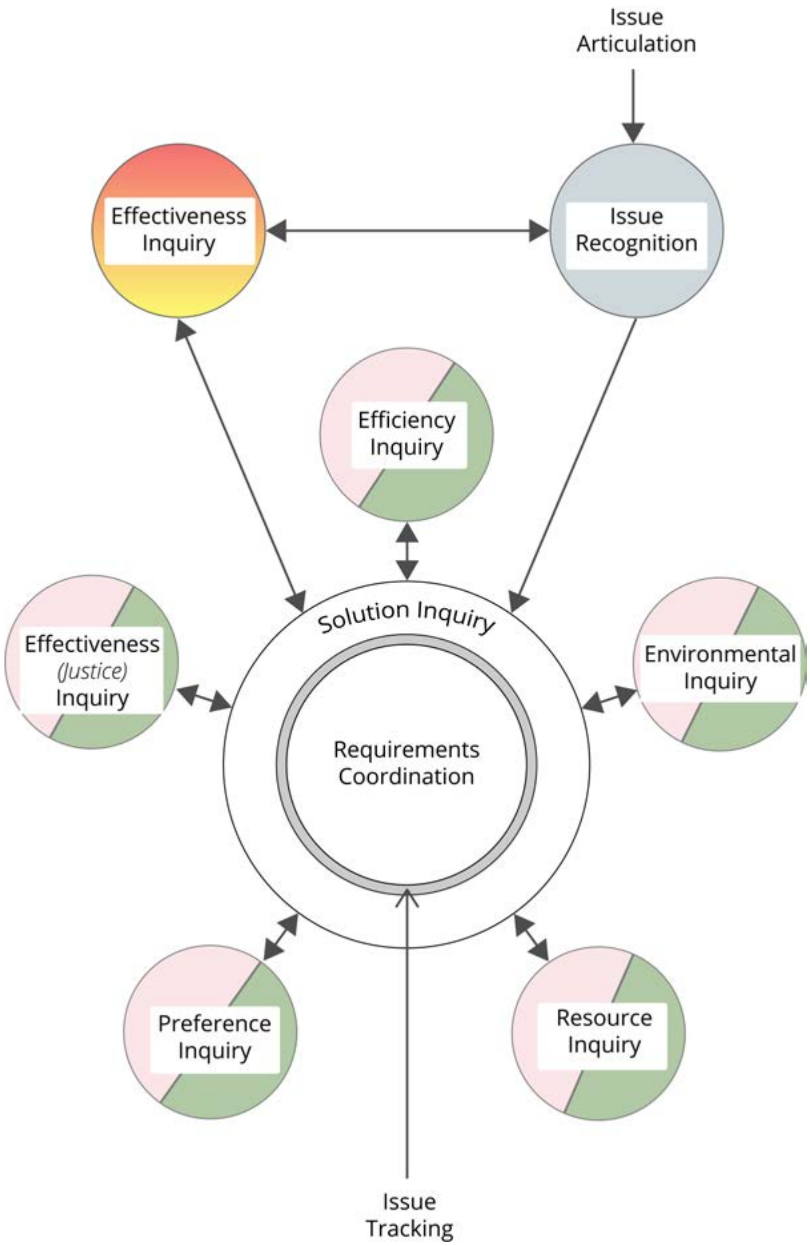

Figure 21. *The Decision System high-level conceptual coordination model.*

out sufficient information, and processes it, to resolve an acceptance determination on a specified technical solution. The inquiry processes search, sort, and decide acceptance. When represented in a decision table, the action is either acceptance, or non-acceptance. The condition is the inquiry process. New technical solutions for an issue in the decision system are processed through a parallel set of these inquiry processes. All potential designs are compared, and designs that do not meet thresholds would be flagged, and hence, need to be re-evaluated (or, adapted).

The primary reason the decision processes are referred to as inquiries is similar to why some legal systems refer to themselves as inquisitorial systems (as opposed to adversarial legal systems). An inquisitorial system is actively involved in discovery and processing of the facts of the situation/case. Similarly, each of the primary decision processes in this model also seeks out sufficient and accurate information to resolve the decision as expected.

This decisioning model may be said to represent an emergent formulaic framework, a "safe scaffolding", for socially iterating (Read: designing and re-forming) the material structure of a community's habitat toward a higher potential state of life-enriched expression. Herein, our social approach structures our economic orientation such that we apply [at least] conscience ("with" [con] + "science") to a common model of reality (the Real World Community Model) that we use to socially structure our actions and behaviors. Hence, all decisions (or "issues") are resolved in alignment with this collaboratively informed and emergent model of the world - the Real World Community Model. In other words, the decisioning model acts as a constructive filter system [of sorts] that builds up and then resolves a decision space. And, the decisioning space draws input from the Real World Community Model's collaboratively developed repository of information.

Together, the structured purpose of these models is to make all 'change' explicit. Therein, they account for each specific [iterative] adaptation to an issued demand from a responsive environment. From a functional perspective, this economic decisioning model exists to support humans in their pursuit of their purpose and their fulfillment, and not to force meaning or labor on anyone.

In its operation, this decision model represents a transparent pool of information that may be inquired into, and through which inquires may be structured to re-orient and re-organize the material environment so its service systems (i.e., our service systems) fulfill our needs more effectively and efficiently.

Herein, there exists 100% complete transparency of the system that processes decision issue data -- 100% open accounting. In the case that the system evolves through machine learning via some form of artificial intelligence, then the AI must be able to sufficiently explain its reasoning for every decision so that all interested humans can understand. A transparent system is the only system that allows for complete trust of the users in the system itself. Information interfaces provide users with transparency into the decision process.

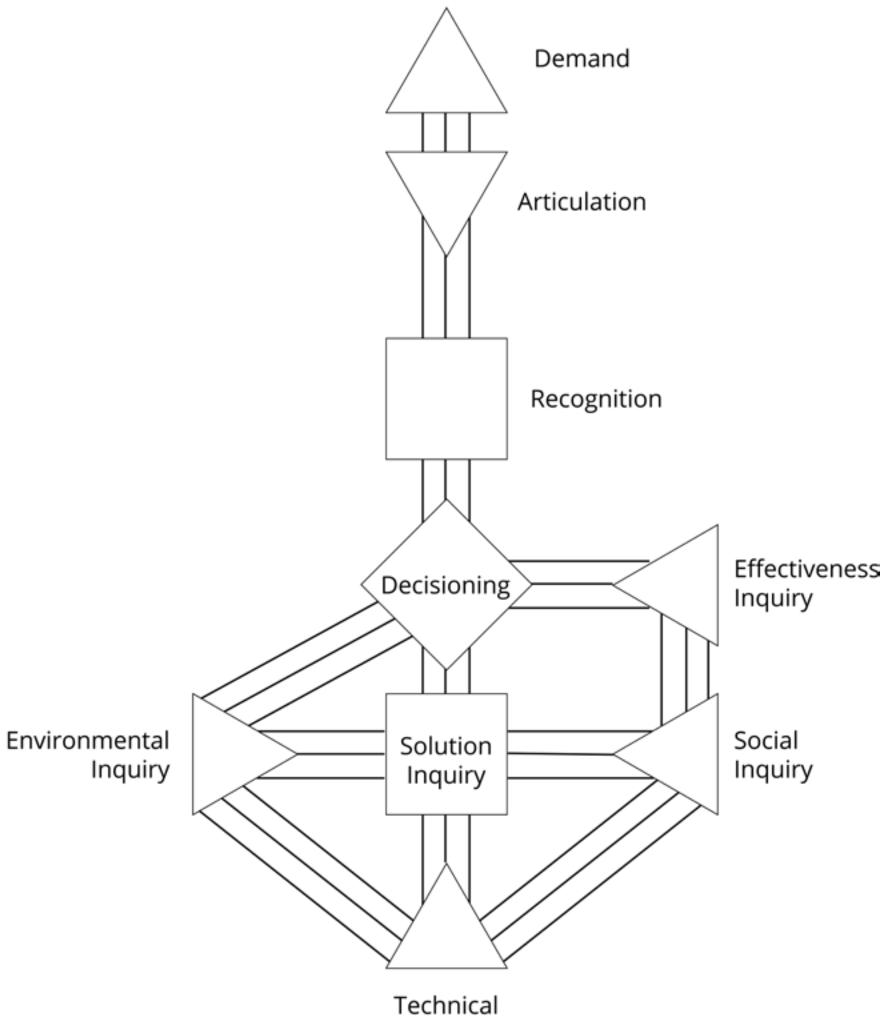

Figure 22. *High-level concept diagram showing the serial and parallel inquiry processes of the decision system as they are presently known. There is a demand that is articulated into the information system where issues are recognized and decisions are solved into solutions, of which one solutions is selected to be operated as the configuration of the system.*

INSIGHT: *Fundamentally, it is natural for individuals to inquire about the social and economic systems they live within.*

Artificial intelligence (AI) is the ability of a machine or computer program to mimic the cognitive functions of the human mind, such as learning, self-improving, identifying, organizing, coordinating, and problem solving. It is likely that, eventually, AI will take over portions of decisioning operation(s) for the habitat service system (HSS).

At a high visual-level, this decision model involves multiple processes of inquiry constraint into an economic issue for the purpose of acquiring and processing sufficient information to arrive at an optimal "designed integration" decision. Practically speaking, each constraining inquiry process is a 'sub-mechanism of action' in a larger and more complex frameworked structure that itself acts as a socio-economic fulfillment 'mechanism of action'. Herein, computers are a useful and accessible technology for tracking and processing data within a complex multivariate [information] system. It is important to note that these inquiries occur in parallel, and some are in a 'static open' state (i.e., they are always in operation; e.g., 'issue articulation inquiry' and 'effectiveness inquiry'). Through the inquiry process we account for all the known variables that impact the system's ability to produce that which individuals' need and prefer.

In a sense, every economic system is a sub-system of a large, finite system, the biosphere. Neither the decision system, nor the community as a whole, could function or even exist without the services of natural ecosystems. These natural systems must be understood if a society is to arrive at economized decisions about economic services and natural resources. Nature is not some sub-system of the economy, though most "economists" would claim it to be so.

The encoding of this decision system means that technical economic interactions among members of the Community are based upon the availability of resources (remember, it is a resource-based model). This type of interaction is essentially what happens between close family members in everyday modern culture all of the time. This economic decisioning model represents the expansion of this familial-type inter-relationship out to an entire [scaled] community. We allow family members to access resources all of the time without expecting an exchange [of labor] or currency in return. This decisioning model represents an extension of our families to the scale of a community.

Though mankind lives on a really big spaceship we call Earth, the more our population and technological capabilities grow the smaller the Earth effectively becomes. In a situation of limited resources, allowing the whims of anyone (or socially exclusive group, "clique") to determine resource allocation would not only be dangerous, it would be suicidal. And, the danger of anyone owning those resources exclusive to themselves with profit as a principal motivator, would be obvious. Such power will be everyone's downfall in a technologically capable environment. "You" wouldn't let anyone own all the oxygen on a space ship "you" were on. The oxygen would *rationally* be considered the common [strategic] heritage of everyone on board (i.e., it would be commonly planned and formally decided for).

If great care is not taken in the use of limited resources, then nobody will have access to them as differential advantage degrades sustainable and moral decisioning, and a "tragedy of the commons" creates conditions of extreme scarcity. Note that the "tragedy of the commons" assumes competition, not cooperation and collaboration. A "tragedy of the commons" is the result of a social organization that failed to cooperate. The tragedy of the commons exists in an environment with more than just the potential for scarcity as a characteristic. The additional characteristic is the encoded concept of competition for resources. A "tragedy of the commons" does not exist if competition within the community for resources does not exist (i.e., the commons follows a "technical" approach).

In the early 21st century, there is an ongoing tragedy of the commons. The Earth is the commons, and it is being pillaged and polluted by businesses and States for their short-term financial and socio-economic interests. This is everywhere around the planet in the early 21st century society, and it is coming to be known as the anthropocene era.

Life isn't about keeping score. The tragedy of the commons presumes competition; it assumes that "I need to compete, to win a competition, in order to ensure I have access to the resources I need." The way to eliminate this problem is to eliminate the structurally incentivized need for competition. Food, housing, clothing, and other basic needs must be absolute guarantees.

Once a community has the basic non-conditioned needs present and prioritized, then it is much easier to calculate economic need fulfillment and re-organization based upon real-time information.

1.1 Global community unit accounting

At a basic level, community economic accounting records information on, and computes information about, specific units:

1. Resource units (a.k.a., resources):
   - A. Material.
   - B. Informational.
2. User units (a.k.a., users):
   - A. Human users (personal and common).
   - B. Human contributors (habitat service team users).
   - C. Other organisms in the ecology.
3. Service units (a.k.a., technical units, production units, service support units, support service units).
   - A. Life.

B. Technology.
C. Exploratory.
4. Habitat units (a.k.a., habitats, cities, city units, habitat service system units, HSS units):
   A. Service dimensional units:
      1. Working cities.
      2. Leisure cities.
   B. Usage dimensional units:
      1. Residents.
      2. Visitors.

At a very basic level, in concern to resources, which all decisions use at some level, there are two primary categories:

1. The type of resource (identity and quality).
2. The amount of a type of resource.

Operational accounting for all resources in community involves:

1. Product design:
   A. When products are designed, there is a record.
2. Product production:
   A. When products are produced or cycled, there is a record.

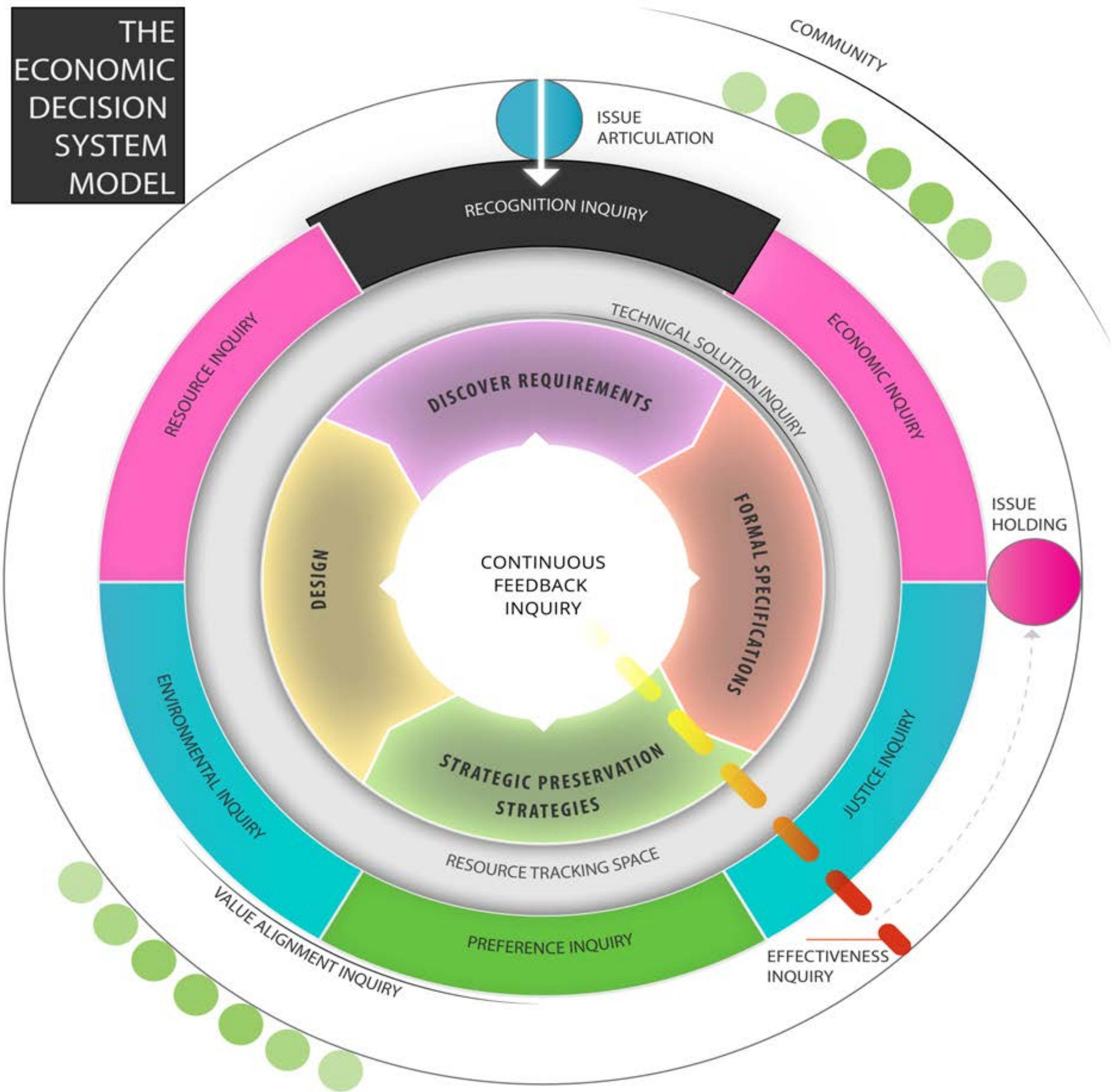

Figure 23. *The Decision System high-level conceptual integration model.*

3. Product delivered:
   A. When deliverables are delivered, there is a record.
4. Product operation:
   A. When products are used, there is a record.
5. Product return:
   A. When products are returned to production (the materialization system), there is a record.

It is important to note here that in community, no trade occurs here; and, there is no "price" on products and no "income" for producers. Community-related and measured "units" are transformed and transported, and re-allocated, and there is a digital record/registration of each event without any price association. In community, neither the habitat service system nor the manufactured product are the property of the operational organization, or any individual; instead, they are common [heritage] resource allocations, to common [heritage] services and goods. Therefore the activities of the habitat service cannot be considered as a change in the assets and liabilities of the habitat operation, and are therefore not linked to actual “income” and “expenses”. A community-type society does not place a price on access to needed services and goods.

> **INSIGHT:** *There are many synchronous, parallel calculations and recursions happening in any economy.*

1.1.1 Societal economic access calculation

In any society, decisions about access to society can occur as a trade, or not as a trade. When there is trade, there are prices placed on [end-user] products and services:

1. **[Supply and want/demand]** In the market, prices are constructed (i.e., priced) by market supply-and-demand. Here, price signals are good at indicating where profit can be made (so that there is capital investment and industrial work). Profitability is indirectly related to human well-being both in terms of benefits (wants) and externalized harm or detriment (costs). Here, there are profit calculated prices and wages; there is profit-incentive in-kind calculation.
2. **[Social benefit and demand]** During transition to community, where trade is still present (e.g., a eco-social-State), then prices may be constructed “in-kind”, based on some socially necessary factor(s), such as labor time, human need, and product complexity. Here, there are common, socially calculated prices and socially calculated wages. Laborers are paid in tokens priced according to some in-kind factor(s) and prices of final products are priced according to some related and/or common in-kind factors. Here, there is social-benefit incentive in-kind calculation.
   A. **Trade in-kind calculation:** Social calculated price (e.g., labor hours, assembly complexity, etc.).
   B. **Social in-kind calculation:** These are orientational objectives (value/-ing variables) that conform productions and production plans to a set of values (e.g., efficiency, optimization, sustainability, modeling, complexity, etc.). Each assembly is a unit (copy), constrained in design, development, and operations by (community) production objectives (production-value variables), complexity, etc.
3. **[Intelligence and need]** In community, there are no traded tokens (i.e., there is no token distribution for work, and no price on end-user products/services.
   A. In community, calculation occurs together, both in-natura and in-kind, in order to produce a global community-habitat network within which resources are shared in common into local and cyclically customized habitat “city” systems.
      1. **Calculation in-natura:** Object and service units that directly meet needs. These units are directly related to human need fulfillment (human well-being).

1.1.2 Societal assembly complexity factors

Identifying and applying a structured decision system format empowers analysts, designers, and users to articulate concepts about fulfillment (to articulate variables in society) in a manner that is both comprehensive and coherent. This approach significantly augments the precision and efficacy of the decisioning and strategic planning. Variables serve as fundamental tools in [strategic and cybernetic] analysis and research, pivotal for accounting and systematizing complex issues, facilitating the development of whole system and fulfillment-oriented solutions. Through this methodical framework, every aspect of a variable - from its identification and conceptual foundation to its measurement parameters and the insights it yields - is meticulously defined, ensuring that variables effectively contribute to a deeper understanding and resolution of real-world problems.

Every society, is in the information execution sense, an index of data for possible usage and betterment, inclusive of:

1. In-kind calculation:
   A. For example, assembly index composed of:
      1. Labor time.
      2. Index of labor time.
      3. Index of paid hours to work time.
      4. Index of prices.
      5. Index of free, common access.
      6. Product complexity.

    7. Index of assembly complexity of service-objects.
    8. Resource-to-Service plan optimization.
  B. Index of plan arrays (plan matrix using in-kind units, intermediary units, objectives units).
2. In-natura calculation:
  A. Production plan matrices using in-natura units.
  B. [Real-world] Objects - index of actualized objects.
  C. Index of resources.
  D. Index of service allocations of resources.
  E. Index of production technologies.
  F. Index of end-user technologies.
  G. [Real-world] Human need - index of needs.

A more comprehensive taxonomical index acknowledges the role of trade and prices in a market economy, while also proposing a system of value based on human needs and community objectives in a non-trade-based society. By integrating assembly complexity, resource optimization, and direct fulfillment of human needs, this taxonomy aims to guide the efficient and equitable distribution of resources and services:

1. **Market trade formation:**
   A. Determination of value based on market supply-and-demand.
   B. Alignment of wages and prices with market incentives and profitability.
2. **Price formation:**
   A. Price index: Notional or socially calculated prices for goods and services.
   B. Price construction: Determined by supply and demand, reflecting profitability and capital investment.
   C. Profit calculated prices: Prices derived from market dynamics, with considerations for profit margins.
   D. Wages in market trade: Compensation determined by market conditions and the value of labor.
3. **Transition to community-oriented trade:**
   A. In-kind price construction: Prices based on labor time, human need, and product complexity rather than market forces. Construction of value based on socially necessary factors like labor time and product complexity.
   B. Socially calculated prices: Prices and wages derived from collective agreements and societal needs. Setting of prices and wages through collective consensus.
4. **Community system without trade:**
   A. Non-monetary exchange: Access to goods and services based on contributions and needs without the use of currency. Distribution of goods and services according to optimized human need fulfillment without trade/token transactions (i.e., without price).
5. **Calculation in-kind:**
   A. Labor hours: The time spent by individuals in productive activities.
   B. Assembly complexity: The intricacy and technical demands of producing service-objects.
   C. Assessment of labor hours and complexity for service-object production.
   D. Resource-to-service optimization: Efficient allocation and use of resources to provide services. Optimization of resources to service delivery based on communal planning. Measures how effectively resources are transformed into finished products or services, emphasizing the optimization of material and energy use.
6. **Assembly index components:**
   A. Labor time index: total labor hours required for production, including power usage considerations. Is the direct (or calculated) amount of human labor time input in each step of production, and its skills, and power usage.
      1. Paid hours to work time index: the ratio of compensated hours to total work time.
      2. Access index: measurement of free and common access to goods and services.
   B. Product (assembly) complexity index (and level; e.g., habitat, habitat sector, network, etc.); inclusive of degree of complexity of design, production, and disassembly demands about a production (i.e., degree of complexity inherent in the product's design and production). Indicates the complexity involved in producing each item or component, considering factors like design intricacy and technical difficulty.
   C. Resource to service optimization index: Efficiency of transforming resources directly into services.
   D. In-natura assembly index: The aggregate of actual resources and services measured by their natural utility to meet human needs. Represents the alignment of the production process with the fulfillment of human needs, emphasizing production that directly serves human well-being without excessive processing or transformation.
7. **Calculation in-natura:**
   A. Production planning: strategic allocation and utilization of resources for production. The coordination of resource allocation to maximize direct human well-being.
   B. In-natura unit: measurement of goods and

services in their natural physical-service form, serving direct human needs. Quantification of raw and processed materials allocated for production.

C. Resource index: Inventory and valuation of available resources.

D. Service allocation index: distribution and assignment of resources to specific services.

E. Technology index: The level of technology applied in production and provided to end-users. Level of technology integration in service-object production and end-user application.

F. User access index:

1. Common-access index.
2. Personal access index.

G. Human need fulfillment index: Assessment of human needs and the capacity of production to meet them. Direct measurement of production's effectiveness in meeting global individual human well-being.

8. **Socialist economic calculation:**

A. Develops an integrated approach to assess and align production (habitats) with human need and preference.

B. Includes metrics for assessing the fulfillment of human need, and the sustainability and social value of production activities.

9. **Integrating unit assembly objectives (e.g., complexity) list.**

A. Assembly index (A or AI):

1. "A" is a composite measure considering the labor time, product complexity, and resource allocation for optimal service delivery.
2. The AI formula could be adapted to include in-natura considerations.
3. An adapted formula to encapsulate the in-natura approach:

Formula:

$$A = \sum_{i=1}^{N} (LTi + PCi + SOi + INi + ...)$$

- Where,
  - LTi = labor time index.
  - PCi = product complexity index.
  - SOi = resource-to-service optimization index.
  - INi = in-natura assembly index.
  - A is the assembly index of objects (that can be copied) in a decision system.
  - N = final/last iteration of the sum.

At the societal scale, variables are used in analytical and research contexts to understand problems and design more optimized and useful solutions:

1. **Name of variable (and identifier).** The variable identifier gives the variable a unique label (ID) for the variable, facilitating clear reference and coherent identification throughout.

A. Object (are not possible variables) : point to.

1. Objects are not variables, but rather entities or items under usage (in a habitat) or study.

i. Here, mechanical, linear (and quantum mathematics) describe motion.

B. Concepts (are possible variables) : define.

1. Concepts serve as variables as they encapsulate measurable attributes or phenomena.

i. Here, statistical and probabilistic mathematics describe correlations (with higher or lesser certainty)..

2. **What concept the variable measures (measured concept).**

A. Describe what exactly the variable is intended to quantify directly, or represent in correlation. This delineates the specific idea or attribute the variable is designed to quantify directly or represent through correlation.

3. **Numerical range of variable.**

A. Specify the minimum and maximum values the variable can take, establishing the scope of measurement. This specifies the variable's minimum and maximum possible values, delineating the measurement's boundaries.

4. **What is the meaning of the range.**

A. Explain the significance of the variable's numerical range, including what the minimum and maximum values represent in the context of the measurement. The significance of the variable's numerical range is clarified, explicating what the extremities of the range signify in the context of the research.

5. **What does the result tell anyone who understand the method (i.e., insight).**

A. Explain the type of information or understanding the variable offers regarding the subject matter under investigation, , accessible to those acquainted with the analytical methodology.

6. **Why the concept valued as a measure.**

A. Detail the reasons why this variable is an important and useful measure within the scope of the research or analysis, including its contribution to objectives. Articulates the rationale behind the variable's significance and utility in the research or analysis, spotlighting its contributions towards achieving the study's goals.

The simplified top-level decision system inquiry variables are:

1. **Labor-time index.**
   A. Labor Hours (LHrs).
2. **Mineralization object [deliverable] index.**
   1. Mineral resource (MR).
   2. Mineral recycled resource (MRR).
3. **Cultivation object [deliverable] index.**
   1. Non-mineral resource (nMR).
4. **Energy process [deliverable] index.**
   A. Power resource (PR).

The more complete the top-level decision system inquiry variables are:

1. **Labor-time index** (and power usage index, therein). Number of hours someone works (individual contributor in contribution life-phase).
   A. Labor hours (LHrs): Quantifies the total hours of labor required or expended for a task or across a project.
      1. In hours of human effort required.
   B. Labor complexity (LCx)
      1. The labor-education complexity of the role.
   C. Power usage index: Measures energy consumption in labor processes.
2. **Assembly-step index** (and power usage index, therein). An assembly step index is a metric designed to quantify and track the progression of production or project phases, broken down into discrete steps or milestones. All assemblies are service resources (life support (LS), technology support (TS) and/or exploratory support (ES). Therein the indeces are:
   A. **Mineralization assembly index** (and power usage index, therein).
      1. Mineral resource (MR): Measures the quantity or value of raw mineral resources required or utilized.
      2. Mineral recycled resource (MRR): Quantifies the portion of mineral resources that are sourced from recycled materials.
      3. Power usage index: Energy requirements in mineral resource processing.
   B. **Cultivation assembly index** (and power usage index, therein).
      1. Non-mineral resource (nMR): Measures the quantity or value of raw non-mineral resources required or utilized.
      2. Power usage index: Energy consumption in cultivation processes.
   C. **Technology assembly index** (and power usage index therein).
      1. Number of hours that go into the production of a service (that go into an object-service support system for users of the habitat).
      2. **Assembly index of total production system:** The object step assembly number (ai) complexity of all materials in all final and intern product assembly types (i.e., assembly index complexity, complexity of assembly):
         i. **Assembly index (ai) for materials** for "means of" production.
            1. Materials Assembly Index (materials ai): Complexity in material assembly.
         ii. **Assembly index (ai) for means of production** (i.e., means of production; the production habitat units.
            1. Production means assembly index ("means" ai): Complexity in production tool assembly.
         iii. **Assembly index (ai) for final production service to end-users**; the personal and common user habitat service units.
            1. Final product service assembly index ("final" ai).
      3. The material component step assembly and step qualifier numbers.
      4. Complexity of disassembly. For example, a lithium ion battery.
         i. Ease of complete recycling. For instance, melt a motor to metal and then recreate the metal. A lithium battery cannot be melted and reformed.
      5. Power usage index: Energy used in technology assembly.
   D. Architecture index (and power usage index therein).
      1. Fixed-land resource (FR).
      2. Power usage index: Energy used in architectural processes.
   E. **Power-technology assembly index** (and power usage index therein).
      1. **Energy required for power production (ERPP).**
         i. In (powered energy input)/(power output).
            1. Watt.hours of powers.
      2. **Power resource (PR):** Total energy-power required, which accounts for the energy resources, and is measured in suitable units like kWh, Joules, etc. Power resources are necessary for the operation or completion of all other assembly processes:
         i. **Mechanical force production:** Physical force measured in newtons (N), or joules for combustion (J). Newton is the SI unit of force and represents the amount of force required to accelerate a one-kilogram mass at a rate of one meter per second

squared.
1. Typically, force production is measured in newtons (N).
2. Typically, energy from combustion or any form is measured in joules (J).
3. In hours of machine effort required (mechanical effort time): Effort or work over time can be measured in terms of power, with the unit watt (W), where 1 W = 1 J/s (joule per second).

ii. **Electric torque/torsion production:**
1. Electric current measured in amperes (A)
2. Intensity (volts per distance meter; V/m), indicating the potential difference or voltage drop (power) per unit length.
3. Typically, electrical power (electric effort time, "W" or "P"): power (P; watt, W) is calculated as voltage (V) times current (I):
   a. P = VI, with the unit of power being watt (W).

iii. **Magnetic pull production:**
1. Magnetic pull (magnetic flux density) is measured in tesla (T) for magnetic flux density or gauss (G), where 1 T = 10,000 G. Tesla is the SI unit, and gauss is used in the centimeter-gram-second (CGS) system.

F. **Transportation-technology assembly index** (and power usage index, therein).
1. **Transport resource (TR).**
   i. Weight (matter + gravity quantity) capacity is measured in kilograms.
   ii. Volume (matter amount/quantity) capacity is measured in mol (for micro-objects) or cubic meters (m^3; for macro objects).
   iii. Distance is measured in meters.

G. **Communication-technology assembly index** (and power usage index, therein).
1. Signal resource (SR).
   i. RF electromagnetic signaling is measured in:
      1. Power density.
      2. Frequency.

H. **Intelligence-technology assembly index** (and power usage index, therein).
1. Intelligence resource (IR).
   i. IR is measured in:
      1. Computability of multimodal space.
      2. Compute time.

3. **Contribution integration inquiry (and index):**
   A. Number of people.
   B. Skilled education of people.
   C. Time of people.
   D. Safety of people.
4. **Mineral integration inquiry (and mineralization index):**
   A. Mineral resources survey.
   B. Mineral acquisition units (raw resources).
   C. Mineral processing units (refined resource).
   D. Mineral solid units (fine resource).
   E. Mineral machining production units (machine assembly resource).
   F. Mineral assembly production units.
   G. Habitat assembly and integration, and disassembly and disintegration.
5. **Biological integration inquiry (and biologics index):**
   A. Biologics resources survey.
   B. Biologics production units.
   C. Biologics processing units.
   D. Living organisms (biologics solid units).
   E. Biologics machining production units.
   F. Biologics assembly production units.
   G. Habitat assembly and integration, and disassembly and disintegration.
6. **Electrical integration inquiry (and electrification index):**
   A. Energy-power resources survey.
   B. Power production units.
   C. Power processing (stabilizing, converting) units.
   D. Power conduit and output units.
   E. Power using machining production units.
   F. Power using operating habitat service-object final units.
   G. Habitat assembly and integration, and disassembly and disintegration.
7. **Economic calculation inquiry (and index):**
   A. Object mathematics (a.k.a., discrete mathematics, linear mathematics) - calculation using natural, physical measurement units.
   B. Statistical mathematics (a.k.a., variable mathematics, probabilistic) - calculation using variables and in-kind units.
8. **Distributive and restorative justice inquiry (and distribution index):** Sector accessibility index.
   A. Life-phase restricted (typically, leisure).
   B. Restorative justice procedures restricted (typically, "criminal legal" action because of "criminal legal" charges).

Assembly step complexity for top-level variables includes, but may not be limited to:

- (labor hours worked) • (wage per labor hour)
  - LHrs • $/Lhr
- (mineral resources) • (distance travelled per resource) • (power used)
  - MR • dist/MR • PR
- (non-mineral resources) • (distance travelled per

resource) • (poser used)
• NMr • dist/nMR • PR

1.1.3 Societal accessibility of assembly factors

The essential societal factors in concern to assembly thinking are:

1. Reference indicator: A list or directory pointing to the locations of topics or names within, or a collection of documents.
   A. In community, there are societal standards within which there is a list of human needs. Habitat master-plan working groups facilitate the fulfillment of preferences therein.
2. Economic indicators:
   A. Labor time.
   B. Material quantity required.
   C. Production availability.
   D. Price (market only).
   E. Salary (market only).
3. Scientific and technical usage.
   A. Measurement tool:
      1. Quantitative measures in research, that indicate specific attributes or conditions.
   B. Comparative scale: Scales used to compare phenomena across different units or conditions,

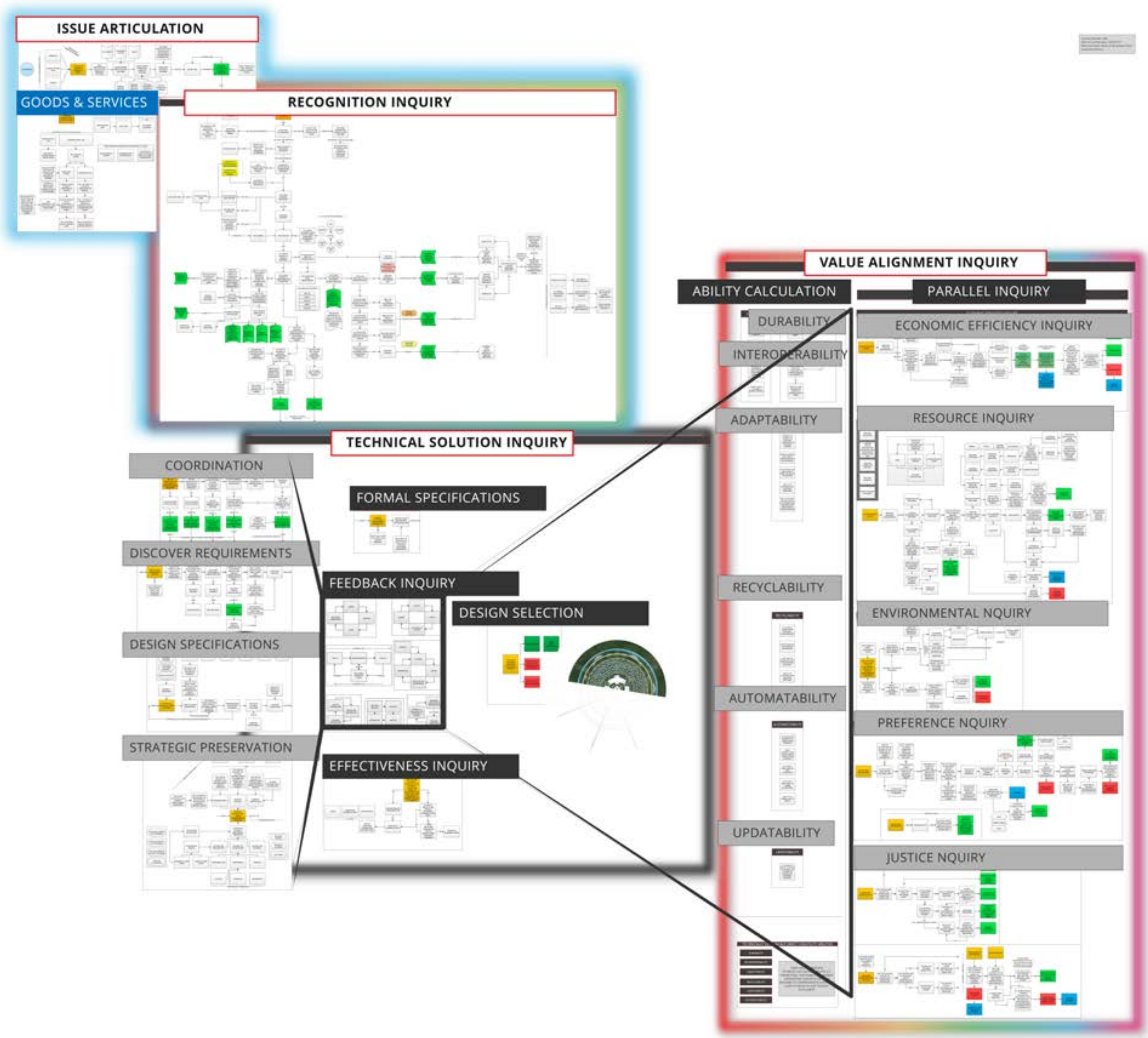

Figure 24. *This is the decisioning system inquiry supra-process for a community-type society. This is a decision system flow chart. Please refer to the project's website for the full size asset.*

such as the pH scale for acidity and basicity.

4. Specific context of assembly index.
   A. Manufacturing efficiency:
      1. Measures the complexity or ease of the assembly process for products, indicating areas for improvement or efficiency gains.
   B. Design optimization:
      1. Serves as a guide for product design, aiming to simplify assembly and reduce production costs.
5. Significance of "index" in the term:
   A. Indicative measure:
      1. The "index" highlights its role as a comparative measure that indicates the relative complexity or efficiency of an assembly process (in meeting needs).
   B. Decisioning tool:
      1. Provides a standardized reference that aids in evaluating, planning, and optimizing manufacturing and design processes.

A highly simplified set of factors for the assembly of society may are:

1. [Information assembly] Documented socio-technical standard indicators.
   A. Sub-standards:
      1. Social.
      2. Decision.
      3. Material.
      4. Lifestyle.
      5. Project.
      6. Overview.
   B. Quantification:
      1. Number of words.
      2. Number of math symbols.
      3. Number of figures.
2. [Labor assembly] Work standard indicators.
   A. Contribution service agreements (work descriptions).
   B. Projects and project coordination visualization.
   C. Project controls and monitoring.
   D. Work evaluation reviews.
3. [Habitat assembly] Habitat standard indicators.
   A. Habitat services:
      1. Life.
      2. Technology.
      3. Exploratory.
      4. Residence.
   B. Life-phase services:
      1. Nurturing.
      2. Education.
      3. Contribution.
      4. Leisure.
4. [Life experience] Societal habitat network final-user access.
   A. Societal intelligence service.
   B. Education intelligence service.
   C. Residentation agreements and habitat service.
   D. Contribution coordination service.
   E. Leisure service (life phase and "vacation").

A simplified three category complexity of production taxonomy:

1. Simple assembly production: Production processes characterized by minimal steps required to assemble or manufacture a product.
   A. Involves straightforward and streamlined assembly processes.
   B. Minimizes the number of components or parts required for assembly.
   C. Emphasizes efficiency and speed in production operations.
   D. Assembly index implications:
      1. A lower assembly index indicates fewer steps or components involved in the assembly process.
      2. Reflects high efficiency and simplicity in production operations.
   E. Implications:
      1. Reduces production costs and lead times, enhancing competitiveness and profitability.
      2. Facilitates rapid scaling and mass production of simple products.
2. Moderate assembly production: Production systems requiring moderate levels of steps and complexity in the assembly process.
   A. Involves multiple components or parts that require assembly.
   B. Balances efficiency with the need for customization or product variation.
   C. Incorporates standardized assembly procedures and quality control measures.
   D. Assembly index implications:
      1. Moderate assembly index reflects a balance between efficiency and complexity in production processes.
      2. Indicates a manageable level of steps required for assembly, allowing for flexibility and customization.
   E. Implications:
      1. Enables customization and adaptation to varying customer needs and market demands.
      2. Optimizes resource utilization and production output while maintaining quality standards.
3. Complex assembly production: Production systems characterized by high levels of complexity and multiple assembly steps.

A. Involves intricate assembly processes with numerous components or subsystems.
B. Requires specialized skills and expertise for assembly and integration.
C. Emphasizes precision engineering and quality assurance throughout the production cycle.
D. Assembly index implications:
   1. Higher assembly index indicates greater complexity and more steps involved in the assembly process.
   2. Reflects the sophistication and technical requirements of the production system.
E. Implications:
   1. Demands investment in advanced manufacturing technologies and skilled workforce.
   2. Supports the production of high-value, technologically advanced products with superior performance and functionality.

1.2 A global decision system

INSIGHT: *Like consciousness, the decisioning system is a self-organizing system that responds in an informed and adaptive manner to the changing conditions within and around it.*

This decision model essentially represents a formalized inquiry-based [constrained filtering solution-orientation] that structures the design and integration of solutions to technical economic problems identified by individuals and systems in the community. Figuratively, critical thought forms critical ideas and sharpens an analysis down to a critically synthesized [optimally able] path. If

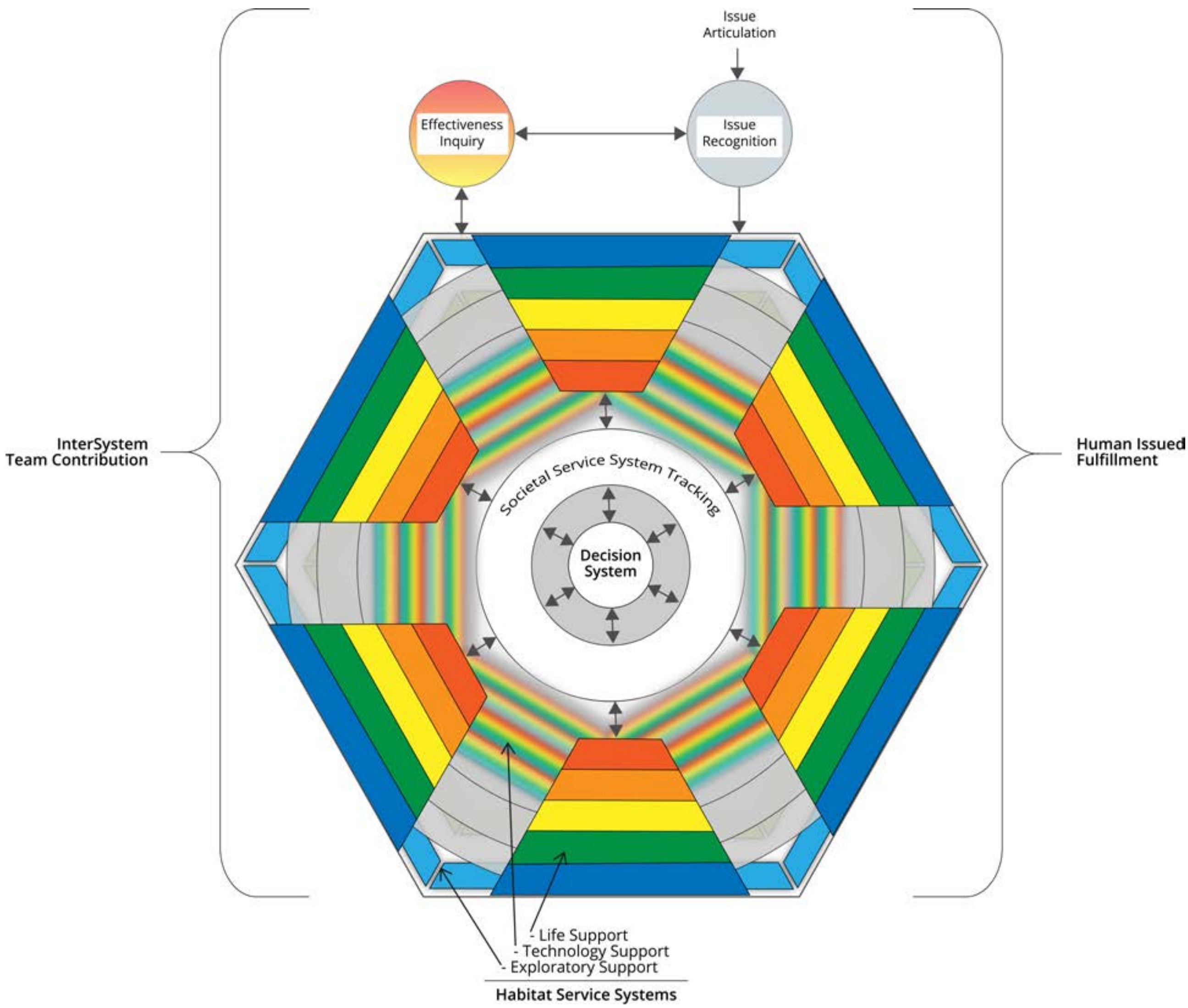

Figure 25. *Decision system integration into a societal-level [human] issue tracking system that generates, through contribution, a global team of habitat service system members who contribute to sustain a set of habitat service systems, which ultimately, sustain human fulfillment.*

the idea of 'open and active inquiry' were to "materialize" as an economic infrastructure, then what would it look like? Would it possibly look like a set of emergently designed, serial and parallel inquiry processes that generate an iterating dynamic [structure] for a higher potential of fulfillment. The output of this systems process is the distributively agreed design specification for restructuring the habitat service system [toward one of greater fulfillment].

These inquiry processes are expressed as formalized (programmatically computational) instructions that have been formally engineered through distributed collaboration into a system into which we feed our demands for an transport-/transformation-ability based upon all known available information, which itself includes a set of protocols for value orientating the decision.

In a community-type configuration of society, these decision inquiries are objective and transparent, as such, a "third-party's" presence to ensure compliance, and quality assurance is not integral. In the market-State where producers hide information from others and costs are cut for profit, then independent quality assurance (and regulatory) bodies are typically required. In community, the societal system is evidence-based and quality-assured, because the system is designed by users, for users. In the market-State, "independent" ("third-party") organizations are supposed to regulate and assure the safety and quality of market-State services and products. Under market-State conditions, these "independent" businesses are necessary because of profit incentives and the presence of secrecy. In community, there are no profit incentives and the economy is operated transparently by users.

Each of these inquiry processes is an 'information discovery system' (for processing formal orientational inquiries into information) as well as an '-ability' (as yes or no / 0 or 1) decision mechanism (or "decision circuit"). The inquiry processes acquire (or 'discover' and 'research') information and then process that information to arrive at an oriented go/no go task-transport decision for the inquired design of a solution to an issue. Here, multiple inquiry processes occur in parallel, each with their own orientational perspective on the issue (i.e., resource, preference, economic, solution, and so on. In general, go/no go testing refers to a pass/fail test (or check) principle using two boundary conditions. The test is passed only when the "Go" condition is met and also the "No" go condition fails. Hence, the inquiry processes are both a set of processes for handling the flow of relevant information as well as a set of processes for determining whether a solution to an issue has met a particular criteria threshold to proceed through to systems-level output. Herein, research provides options.

This decision model is sub-divided into a systematic set of inquiry processes that structure the micro-calculated arrival at a selected design [transformation / transport] decision. Some of these processes operate in parallel and others in serial.

> **INSIGHT:** *Decisions are simplified (and visualized) through flow charts, which can be constructed with some measurable and understandable degree of certainty to accurately represent decisions and outcomes in the real-world. Once we have sufficiently accurate and useful flowchart, then it tells me which solution, outcome, and decision to select. Done! Now let's start implementing, operating, and improving over time. Human drama reduces the efficiency of this process, while intelligence improves efficiency.*

1.2.1 Global decision inquiry accounting

The decision [system] protocol of community is an integration of different "disciplined" rule sets [objectives information sets] that are followed to produce changes in the material socio-technical real-world:

1. The same "economic rules" means the operation of an applicable standard for all decisions and calculations that go into material cycling, production and distribution.
   A. Primary data input is: materials data, contribution data, techniques data.
2. The same "physical rules" means the operation of a physically habitat service system that supports individual accessibility to service and object fulfillment.
   A. Primary data input is: availability data, demand data, user data.

1.2.2 Issue resolution

Issues create projects to resolve issues via decisioning, resulting in a solution that is selected and executed; whereupon the solution itself is then operated as a project:

1. Who creates issues?
   A. Humans with needs and preferences, given an environment.
2. Who creates projects?
   A. A societal-habitat contribution service working group, given protocols.
3. Who can staff projects?
   A. Contributing individuals, as part of a pool of possible individuals, given protocols.
4. Who selects the individuals to staff projects?
   A. A protocol, the coordinator, and/or the team itself.
5. Who uses the deliverables of projects?
   A. An InterSystem team member (a.k.a., team access), a community user (a.k.a., personal access), a community user group (a.k.a., common access).
6. What is the procedure/method?

A. For meetings.
B. For deciding.
   1. For collecting information.
   2. For analyzing information.
   3. For synthesizing solutions as information.
   4. For deciding a solution (from the many solutions).
7. When do you vote/poll?
   A. When there is an objection to a decision not resolved by a protocol?
   B. When there is a preference and not a top-level category of need?
8. How do you vote/poll?
   A. Unity [of Voted Agreement] - how many users must agree to a specific choice, for the selection to be taken?
   B. Quorum [of Voted Agreement] - how many individuals of the total population of individuals must vote for the vote to be counted?
9. Who votes/is polled?
   A. The team responsible/accountable for the direct work, as organized in a functional organization structure.
   B. The habitat population whose life experience may change due to an change to the habitat.

Issues are resolved through:

1. Their identification and given current environment/situation.
2. Source of all data about issue (record).
3. More data about issue (collection and analysis inquiries).
4. Proposed description of change to resolve issue (synthesized solutions).
5. Selection of proposed change to resolve issue (solution approval).
6. Execution of change to resolve issue.

Within any decision system there are socio-technical procedures for information collection (inquiring), analysis (assessing), and final decisioning:

1. Collecting data (via procedure).
2. Collating date (via procedure).
3. Analyzing data (via procedure).
4. Deciding data (via procedure).

To complete a master plan decision inquiry, it is necessary to understand and visualize the next iteration (version) of the encoded material system (as a global habitat service system) operating a set of services for humanity based upon:

1. Functions (a.k.a., needs and objectives).
2. Components (a.k.a., specifications and

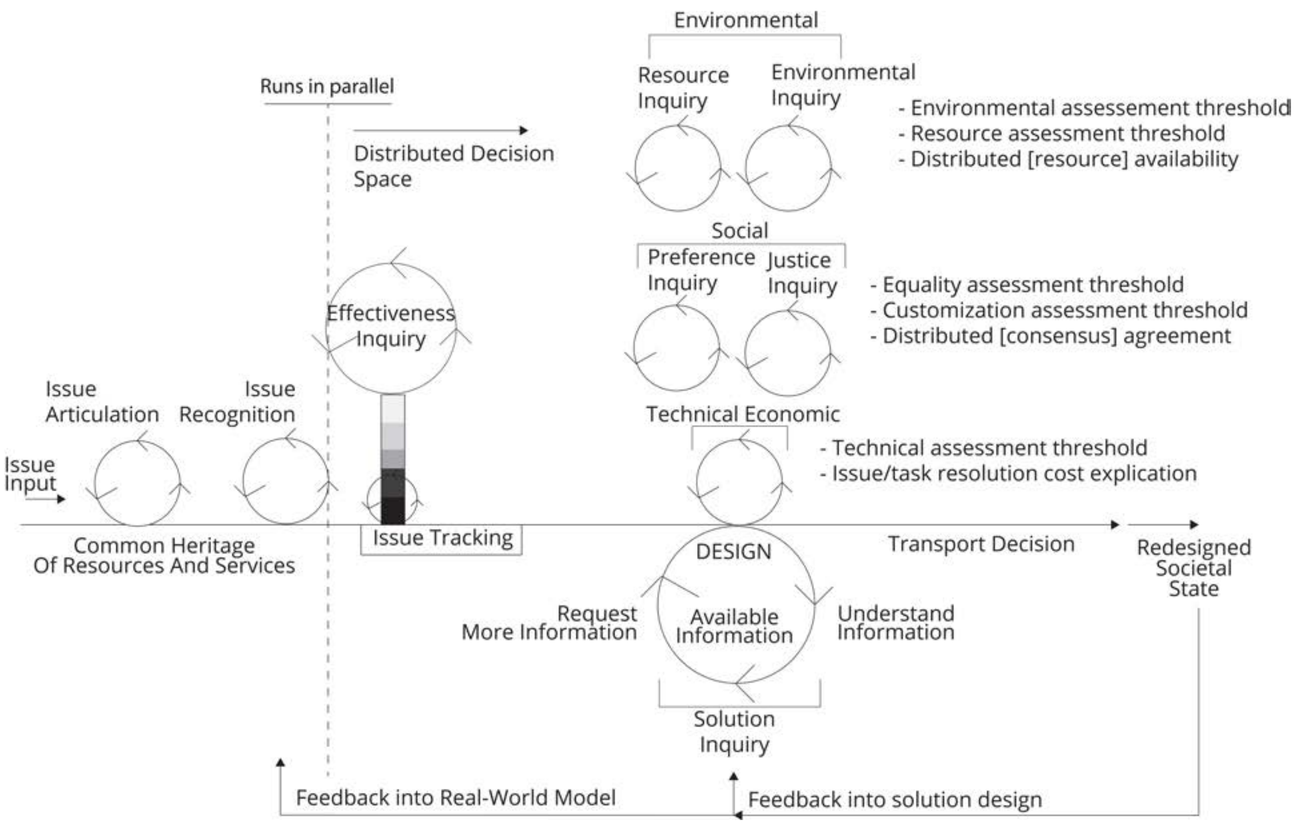

Figure 26. *The decisioning system inquiry processing model.*

visualizations).
3. Materials (a.k.a., objects).
4. Fabrication (a.k.a., construction).
5. Operation (a.k.a., assemblies).
6. Defabrication (a.k.a., disassembly, deconstruction).

The control within a community-based decision system is transparent, and accountable:

1. A decision (solution, sub-solution) is selected by whom?
    A. Who and how is a decision taken/approved?
2. A decision (solution, sub-solution) will affect, and at what proximity, whom?
    A. Now a decision is taken, who will it affect.
3. A decision (solution, sub-solution) is accepted under what criteria? The resolution of an inquiry has an acceptance criteria for the solution being marked acceptable.
    A. Define and visualize how the decision was constructed, taken/approved, and the result(s) evaluated.

1.2.3 Issue resolution inquiry phases

Issue inquiries (processes) collect data, analyse that data, produce modifications to specifications, and also, select for approval or disapproval possible specifications, given inquiry parameters. The economic decision space is composed of the following [issue] inquiry processes (note: each is a tool for economic decisioning at scale):

1. **Issue articulation inquiry phase -** the “static” open acceptance of an inquired need which has been articulated into the [continuing] common decision space. This is a ‘phase’ space where data is being structured by previously known information.
2. **Issue recognition inquiry phase -** recognizes the issue. This is a ‘phase’ space where data is being structured by previously known information.
3. **Issue inquiry tracking -** tracks/traces the issue.
4. **Effectiveness inquiry (a.k.a., risk inquiry, concerns inquiry) -** ensures that decisions do not put the community at “risk”.
5. **Continuous feedback inquiry -** the mechanism, which integrates with the Real World Community Model and informs a larger information system.
6. **Social (value) alignment inquiries** - the set of inquiries, with various delineated objectives that provide a criteria of the selection of a final formal specification.
7. **Technical solution inquiry -** the formal specification[ing] for the socio-technical solution. This inquiry necessitates engineering work and results in a formal specification (that can be operationalized).

NOTE: *It is possible to view each of these inquiries as a "governance" control mechanism. Also, each of these inquiries is effectively value alignment inquiry to ensure the final executed solution is up to community values and standards. Every solution to be executed must be appropriately aligned within each value inquiry set to be approved.*

It is also possible to view the parallel inquiry process as follows (some of the categories diverge slightly from those above):

1. **Issue articulation and recognition** - input a description of an issue into an analysis system that recognizes the issue as one of human need fulfillment within society, or not.
2. **Solution inquiry** (a.k.a., solution accounting inquiry and resolution, technical solution inquiry) - shows the current, formal specification for the socio-technical solution. This layer includes a simulation of the master-plan, as well as all decisioning data from the other inquiries. The deliverable of this inquiry is the final master-plan specification and its selection, as well the history of iterations leading up to the final solution and its selection, and all reasoning therefore. Solution inquiry holds all data relevant to the master-plan for:
    A. Global human need fulfillment in the case of the network of habitats, and
    B. Local human need fulfillment in the case of a local habitat.
3. **Development inquiry** (a.k.a., technical development inquiry, socio-technical engineering inquiry and resolution) - this is where the engineers and other technical system developers work to develop the master plan. Development inquiry could be considered part of solution inquiry, or it could be considered its own separate inquiry. This is where engineering takes place. This is where human and engineering requirements are accounted for. Development inquiry must account for all material inquiries:
    A. **Mechanism inquiry**:
        1. What is the mechanism that meets the need and completes the issue?
            i. What are the objects (materials)?
            ii. What are the data (concepts)?
            iii. What are the procedures (instructions)?
            iv. What are the calculations (mathematics)?
    B. **Land inquiry**:
        1. What is required of the master plan in terms of land?
        2. How can the land situation be optimized?
    C. **Need inquiry:**
        1. What is required of the master plan in terms

of completing human needs?
   2. How can human need fulfillment be optimized?
   D. **Resource inquiry**:
   1. What is required of the master plan in terms of resources?
   2. How can resources be optimized?
   E. **Production inquiry**:
   1. What is required of the master plan in terms of production services (means of production)?
   2. How can production be optimized?
   F. **Access inquiry**
   1. What is required of the master plan in terms of user access?
   2. How can user access and user interface be optimized?
4. **Need inquiry** (need accounting inquiry and resolution) - account for all information associated with common, objective human need. Directive to provide reasoning for how a solution resolves the issue(s) and meets human need(s). This is where human need is accounted for.
   A. Does the solution meet human needs and resolve the issue?
   B. How better could the solution meet human needs and resolve the issue?
5. **Preference inquiry** (preference accounting inquiry and resolution) - accounts for human preferences in the context of human needs. This is where human preferences (customization) is accounted for.
   A. Are human preferences valid in this case?
   B. Are there human preferences?
   C. Can production flexibility meet human preferences?
6. **Access inquiry** - accounts for all information related to access of socio-technical services. Is the solution result "just" (as in, justice), in concern to both:
   A. **Distributive justice (i.e., material need fulfillment)** - completeness, and fairness and a lack of separation in socio-economic access to human need fulfillment, egalitarian and sufficiently complete, well-being/flourishing. A directive to ensure access to all needs (and preferences) for someone's life phase, given all that humanity has to offer.
   1. Is the socio-technical solution fair and optimizing of human flourishing/well-being?
   B. **Restorative justice (i.e., conflict resolution)** - prevent the likelihood of trauma and facilitate healing where trauma occurs. Restore optimized well-being/flourishing after harm. A directive to restore well-being and reduce the likelihood of future suffering.
   1. Is the socio-technical solution certainly going to restore well-being from conflict, and reduce the likelihood of future conflict?
7. **Resource inquiry** (resource accounting inquiry and resolution) - identify all relevant information about resources. Does the solution optimize resource usage and availability into the future?
8. **Economic calculation inquiry** (calculation accounting inquiry and resolution) - simulate different resource configurations, and identify optimal configurations. Identify all relevant information about possible ways resources can be configured to meet human requirements for resolution of need issues. Use computational systems and information technology to facilitate the flow of goods and services throughout by computationally planning socio-technical system. By the use of computational systems and technology, the flow of goods throughout society can be rationally planned, controlled, and monitored to minimize undesired human effort, to maximize human fulfillment, and to stay within the limits set by the regenerative carrying capacity of the planetary ecology.

Additionally, it is possible to break down the parallel decision inquiry process into the following set of societal-habitat production concepts:

1. Need account inquiry (issue role).
   A. Need-specific attributes of decisioning include:
      1. Frequency.
      2. Duration with required production.
      3. Recency of last completion.
2. Preference account inquiry (user role).
   A. Preference-specific attributes include:
      1. Customiz[ability].
      2. Personal selecta[bility].
      3. Personal access[iblity].
3. Resource account inquiry (viability role).
   A. Resource specific attributes include:
      1. Availability.
      2. Substitutability.
      3. Usability/suitability.
4. Technology account inquiry (functional role).
   A. Technology specific attributes include:
      1. Scalability.
      2. Readyability.
      3. Functionality/applicability.
5. Access account inquiry (habitat role).
   A. Access-specific attributes include, but are not limited to:
      1. Team (system/contribution).
      2. Common.

        3. Personal.
6. Service account inquiry (team role).
    A. Service-specific attributes include:
        1. Technology (infrastructure).
        2. Life.
        3. Exploratory.
7. Local account inquiry (user role).
    A. Societal contribution account inquiry.
    B. Common-local account inquiry.
    C. Common-personal account inquiry.
8. Design account inquiry (team role):
    A. Design-specific attributes include:
        1. Strategic planning.
9. Operations account inquiry (team role).
    A. Operations-specific attributes include:
        1. Operational continuity and maintenance.
        2. Incident response.
10. Transition account inquiry (team role).
    A. Transition-inclusive attributes include, but are not limited to:
        1. Legal organization.
        2. Employment (salaried).
        3. Training and education.

In order to arrive at a resource 'allocation and occupation' decision the system inquires about information from a wide variety of open and collectively, commonly informed sources. It processes the information it receives in a strategically informed and formalized manner that aligns the outputs of the decision system with a desired orientational direction, a purposefully directed value orientation. This direction is encoded in two supra-processes, that of "Technical Solution Inquiry" and "Value Alignment Inquiry". At the economic level, a 'value' is a qualifying measurement (i.e., a threshold). Note that the "value alignment inquiries" have a 'feasibility/viability measurement' program accompanying them, which triggers a "go" or "no go" for transformation/transport when a programmed information threshold is met. The Solution Inquiry system is more greatly a process of resolving for technical integration feasibility.

Once an "issue" is recognized it enters the "Common Decision Space" which represents a technically value oriented approach to the fulfillment of needs in a community.

1.3 Decision resolvability categorization

In concern to the resolvability of a decision, decisions be categorized based on certainty, in the following ways:

1. Presence of problem or opportunity, issue.
2. Sufficient or insufficient data (to resolve issue).
    A. Sufficient or insufficient collection (is situation sufficiently data collected to take a decision; what is significance?).
    B. Sufficient or insufficient analysis (is situation sufficiently understood to take a decision; what is confidence?).
3. Understand and work to resolve situation/issue (with certainty).
    A. High likelihood/consequence.
        1. Correlate knowledge.
        2. Develop.
            i. Standards.
            ii. Technologies/countermeasures.
            iii. Operational/tactical guidelines.
    B. Medium likelihood/consequence.
        1. Correlate knowledge.
        2. Validate.
            i. Standards.
            ii. Technologies/countermeasures.
            iii. Operational/tactical guidelines.
    C. Low likelihood/consequence
        1. Optimize/iterate (Habitat Service System specific).
            i. Standards.
            ii. Technologies/countermeasures.
            iii. Operational/tactical guidelines.

All decisions are projects with master plans. All projects are resolved through the identification of problems and the explanation and execution of proposals (i.e., projects exist to resolve problems). When it comes to identifying whether a problem/issue has been resolved through a proposal, the following questions become most relevant on the solution-design side:

1. Has the problem changed?
2. Is the current organization still the most effective way to resolve the problem?
3. What is the problem/issue.
4. What is the confidence the proposal will solve the problem?
5. What method is used to construct the proposal to solve the problem?
6. What is the solution master plan (proposal) to solve the problem?

And on the user-operation side:

1. Has the proposal solved the problem?
2. Has the problem been solved another way (not through action on the proposal)?
3. Has the problem changed?
4. Is the current organization still the most effective way to resolve the problem?

1.4 Variability/complexity reduction

A.k.a., Complexity reduction, variability reduction, decisioning.

In any decision system, complexity must be reduced in order to arrive at a decision. In cybernetics, this is called variability reduction (a.k.a., complexity reduction). In the real-world, most everything is connected to everything else in a unified manner. Invariably, the complexity must be reduced -- any decider/decisioning process can't account for everything. A real-world decision system requires a method[ology] for reducing complexity. Community uses systems socio-technical (societal) engineering methods. In this decision system there is a unified mix of complexity and recursion to reduce the societal system to the following fundamental (axiomatic) sub-system categorizations:

1. **The social information system (Read: Societal Specification Standard, SSS)** is based on the fundamental systems of every type of society. This division of society into top-level systems is the first method for reducing the complexity (variability) reducing structure (i.e., the overview, project, social, decision, material, lifestyle standards).
   A. *A ("national") directive to produce a community integrated societal information system.*
2. **The decision system** acquires, analyzes, and decides solutions based on complexity reducing methods:
   A. *A ("national") directive to produce a network of habitat service systems.*
   B. A means of reducing complexity (i.e., limiting variety), in order to have a workable decision problem, and select and execute an optimal solution choice, based on a parallel value alignment inquiry process and a given engineering inquiry solution.
      1. The parallel value inquiry process acts, in part, as a mechanism for complexity/ variety reduction, using community values-/ objectives-based models. This value inquiry process reduces the potential variety of inquiries and solutions, and facilitates the selection of an optimal, or set of optimal solutions as those most represented by community. In other words, the decision system's parallel value inquiry process reduces the potential variety of inquiries and solutions to those representational of community.
      2. A means of confidently stopping data collection and information analysis to select and execute a solution to the decision problem (i.e., stopping rules). Stopping rules are the final point/threshold of complexity reduction before a decision is taken. Every inquiry collects data to a threshold, analyzes the data to a threshold, and takes a decision regarding "go"/"no go" execution of a specified solution selection.
      3. Selection (elimination of variety) allows for the production of complex socio-technical assemblies from simple (heterogenous) building blocks (composed of homogenous minerals and organics), over time with intention. Objects moved into better positions by better concepts, over time, build more complex and fulfilling things. It is now possible to build a global community-type society, as a unit.
3. **The habitat service system** is based on the fundamental material service systems for every type of society. This service system exists because of operational socio-technician teams using InterSystem resources, tools, skills, and knowledge:
   A. *A ("national") directive to participate in the movement of information and materials into a community-type configuration.*
   B. The material habitat teams are educated, certified, onboard as team members, and follow standard manuals and procedures in order to produce all socio-technical services:
      1. *A ("national") directive to organize and produce socio-technical habitat units.*
      2. Contribution support ("national") services.
      3. Life support services.
      4. Exploratory support services.
      5. Technological support services.
      6. Decision support services.
      7. Ecological support services.
   C. The user access outcome types available from the production of socio-technical services are:
      1. *A ("national") directive to move resources, technologies and information into the coordinated habitat-structured community commons.*
      2. InterSystem team access.
      3. Common access.
      4. Personal access.
4. **The lifestyle experience** of different phases of the current societal life:
   A. *A ("national") directive to reduce the number of contribution years to provide for optimal societal leisure fulfillment.*
   B. Nurturing.
   C. Education.
   D. Contribution.
   E. Leisure.

To clarify, there are two most relevant and related statistics in concern to the idea of system change in general are variety and variability. Variety and variability are conceptually related to the two standard deviation formulas, as standard deviation is a measure of how data points vary or are dispersed within a dataset. Viability and variability are themselves related concepts in the context of system change and the spread/dispersion of data points [in the context of formulas]:

1. **Population standard deviation (σ):**

   $\sigma = \sqrt{[\Sigma(x_i - \mu)^2 / N]}$

- σ represents the population standard deviation.
- Σ signifies the summation symbol (sum of all terms in the formula).
- xi represents each individual data point in the population.
- μ is the population mean (average).
- N is the total number of data points in the population.

   A. Variety: In this context, variety is represented by the differences (xi - μ), which measure how each individual data point deviates from the population mean (μ). These squared differences are then summed, providing a measure of the variety or diversity of data points within the population.
   B. Variability: The population standard deviation (σ) is the measure of variability. It quantifies how much data points vary from the population mean, reflecting the overall variability of data within the population.

2. **Sample standard deviation (s):**

   $s = \sqrt{[\Sigma(x_i - \bar{x})^2 / (n - 1)]}$

- s represents the sample standard deviation.
- Σ signifies the summation symbol (sum of all terms in the formula).
- xi represents each individual data point in the sample.
- x̄ is the sample mean (average).
- n is the total number of data points in the sample.

   A. Variety: Similar to the population standard deviation formula, variety is represented by the differences (xi - x̄) in the sample standard deviation formula. These squared differences capture how each individual data point deviates from the sample mean (x̄), reflecting the diversity or variety of data points within the sample.
   B. Variability: The sample standard deviation (s) is the key measure of variability in the context of a sample. It quantifies how data points vary from the sample mean, indicating the sample's overall variability.

What information can be derived from sampling and analyzing data statistically?

1. What is the deviation from the mean?
2. How do the data points (sampled) deviate and spread out?
3. What is the relevant confidence that the system will express optimal states, conditions, behaviors and resource configurations?
4. What are the parallel decision agreement inquires?
5. What are the inquiries stopping rules with thresholds of confident agreement?
6. Do outcomes deviate from expectations?
7. How do the outcomes fluctuate (and their trends) over time?

1.5 Parallel issue inquiry

A.k.a., Parallel issue inquiry process, parallel issue inquiry space, the parallel decision inquiry space, the parallel decision mechanism, parallel decisioning, the valuing space, the valuing mechanism, the objectives integration, the orientational component, etc.

This is a common economic decision space for issues that pertain to common heritage resources and common actions, and are not urgent in their situationally related awareness. In the decision system, the method of variety reduction is the parallel issue inquiry protocol/process, within which different inquiries have stopping rules. This is a complex solution inquiry [dynamic] space for strategically iterating and adapting the global and local socio-technical design of the habitat, and of society in general. This decisioning space may also be referred to as a collaborative information processing space in a complex, common real-world. And finally, it is otherwise known as a parallel value-oriented economic decisioning process. It is important to recognize that it might be more accurate to call this socially “common” decisioning protocol/mechanism a “distributed decisioning space”. This decisioning space involves the strategic and iterative designed re-structuring of common [heritage] resources into a common dynamic platform for human socio-technical habitat fulfillment.

CLARIFICATION *The execution [of the choice/ solution in solution inquiry] is taken by a set of parallel value-/objectives-aligning inquiries, each with their own agreement decision (typically visualized as a red "no-go" (no agreement to execute) or green "go" (agreement to execute) for the execution of the solution.*

This common parallel decisioning space is ‘person-independent’ in its structure. If a person independent structure is not maintained in the iterative re-design of a community, then power structures will begin to form, which lead to competition and instability within the community. The parallel process of open and active inquiry is a person-independent structure because it operates independent of a socially hierarchical power structure. It is also sometimes known as a 'lateral collaboration network' or an 'organized collaborative processing commons'.

Beliefs and opinions must be filtered and empirical evidence evaluated for its potential to provide an adequately optimized solution to an identified problem or issue. This is a decision space that requires 100%, complete transparency to everyone in the [informed] community, and it is "carried out" in a manner that is limited in opinion. Instead, it is informed by a common repository of information including a set of formalized and validated processes [for transforming the information-resources)].

This decisioning space 'processes' decisions that affect the entire symbiotic socio-economy of the community and everything in the habitat over time, and they must be resolved via commonly informed, formalized, and validated methods.

Each inquiry set in the parallel inquiry process group represents a value/objective in society. Values (objectives) rank by means of comparing what is "good" (a desirable direction, action, or condition) and of value, and what is "bad" (an undesirable direction, action, or condition) and not of value. In this sense, a value is a comparator function. Herein, the value inquiries compare the current solution (design, system, etc.) to other solutions and to what is the identified (or identifiably) "good" direction, action, or condition". This identifiable "good" is often referred to as "that which is optimal", given what is known and available. Each value inquiry process set inquires into whether a given solution is "good" to be executed upon (Read: green to move forward, agreed to implement) or "bad" (Read: no more forward movement, not agreed to implement). Here, decision options are being evaluated against a set of criteria specific to each value set (Read: set of objectives associated with each inquiry discipline). The criteria are representational of the "good", and the "good" are classified as values.

Once values have been rationally conceived, then they can be used within a decision system to compare new solutions. Rational societal decisioning involves the rational conception of a set of identifiable values that can be used as a means of comparing amongst problems and their solutions. After rational conception comes classification of problem conceptions. Classification denotes the principal of similarities and differences (i.e., of comparison). Human values are rational conceptions of conditions that generate the experience of flow and mutual fulfillment among a population. In order to carry out a comparison, memory is needed. Memory is impossible without a physical medium that takes up some space. To have a comparison even (comparing solutions) memory must be present.

If two solutions (e.g., goods, habitats) are comparible/compatible neither by a cardinal nor an ordinal measure, then there is no criteria by which they can be compared (i.e., they are incomensurable; i.e., not comparable equally):

1. **Cardinal measure** (quantity measure with potential for the application of **linear algebra**) - having an absolute ("concrete") quantity. Here, nothing is said about the scale. For example, 15 units of apples and 13 units of coal.
2. **Ordinal measure** (scale/quality measure, uses **statistics** primarily) - ranking objects/services as higher or lower (e.g., such as in priority, sustainability, etc.). For instance, one thing is more or less important than the other. Here, there is a scaled relationship ("concept") between two or more objects. For example, having shelter is more important to survival needs than having a television.

NOTE: *Value alignment inquiry is a form of parallel distributed intelligence; it is an socio-technically engineered for of intelligence for mutual human operationalization.*

This common societal parallel decisioning space accounts for [at least] the three interrelated concepts upon which a sustainable economic system is built (and represent comparative 'constraints'): economic awareness; social awareness; and environmental awareness. These are commonly known as the "three pillars" of sustainability, and represent the three sub-conceptual elements of which the concept "sustainability" is composed:

1. **Technical [economic] awareness**: How do "our" decisions impact the function and usability of societal service and machine systems? How do our decisions impact our relationship to simple assemblies (static assemblies) and machines (dynamic assemblies)?
2. **Social [economic] awareness**: How do "our" decisions impact individuals' effective and efficient fulfillment, including the equitable distribution of goods and services? How do our decisions impact our relationships with one another?
3. **Ecological [economic] awareness (a.k.a., environmental economic awareness)**: How do "our" decisions impact the natural environment (including natural ecological services) from which "we" derive those resources that produce our goods and services and sustain our very lives?

These three concepts involve variables that have an observable effect on the state(s) of the Habitat, our community, and ourselves as [emerging] individuals. Hence, in the decisioning space, each concept[ual relationship of] "awareness" has at least one associated inquiry (as an associated process, or decision mechanism). In this decision space (i.e., determinable probability space) these concepts are interconnected and rely on an exchange of information between one another [in a solution-oriented interrelationship] to inform an optimal decision [through parallel and serial processing of information in the system]. In other words, this common decision space represents a logical and systematic approach to deciding usefully at a community level.

It could be said, herein, that 'social value' is a value maintained by the whole of a society, equally exhibited and distributed. This community recognizes three core 'social values' for their interrelated ability to maintain a stable direction toward a higher potential. The three core values are: self-directed freedom; efficiency; and justice. Together, these values (which are detailed in the Social System specification) form the idea of a truly "civilized society". They must be accounted for when arriving at decisions that affect the state of a "civilized" society. Every civilization functions on the basis of a spectrum of self-directed freedom, efficiency, and justice. Appropriate attendance to these value conditions are necessary for the creation of a stable socio-economic system; which allows for the self-directed pursuit of our goals and purpose. If these value conditions are not sufficiently satisfied, then our ability to express our purpose freely is diminished. If every system does not gradually progress toward greater efficiency, greater facilitation of individuals' self-directed freedom, and greater material equality and transparency, and reduced conflict, then our purpose is diminished. Other values are relevant, but if these values are ignored, then the ultimate sacrifice is the stability of the community.

If value conditions (as "awareness's") are not accounted for in the arrival of economic decisions, then instead of moulding to our needs (i.e., intentional reinforcement), the economy will adopt a secondary characteristic and begin to influence and mould its own values [and structurally generate its own, potentially corrosive, behaviors]. In other words, if we do not direct and orient our economy (through our awareness's), then it is likely to begin directing and orienting us. If values encode specific modes of behavior in a society, then it would be unwise to allow (or to give away) ones direction to an outside economic entity. Hence, an "intentional community" continuously reconsiders its own designs.

INSIGHT: *True "performance" is a synergy of optimized efficiency [with effective motion].*

1.5.1 The integrator and comparator analysis structure

In order to resolve a solution with the greatest certainty, given that which is available, the parallel inquiry processes (and all of its sub-processes) have:

1. A collecting component - that collects data on the environment and on the solution.
2. An integrating component - that orders the data collected and analyzes the total available to produce and acceptable and optimal solution (a best solution).
   A. A comparing component - that compares a solution to other solutions and to self-analysis to:
      1. Its alignment with a specified conception of objective value (using rational assessment and statistical analysis). Here, functional relevance is determined.
      2. To other similar solutions (using matrix linear algebra for material economic technical unit planning). Here, optimal resource configurations are determined.
3. A recording component - that records the integration and shares the recorded integration.
4. An acting component that acts to execute the integration:
   A. A standards setting development group (SSDG).
   B. A decision system solution master-plan group (DSMP).
   C. A habitat team operations group (HTOG).

The parallel inquiry decision process ranks solutions based on the alignment of the solution with a set of conditional [value inquiry] objectives, which have been determined to most likely orient toward expected outcomes (generated desirable results), while reducing uncertainty and increasing confidence. The solution inquiry process integrates the results of the value alignment inquiries to produce the best/optimally engineered socio-technical solution. Together, the total parallel inquiry process decides the solution. Practically speaking, a decision working-group team, supported by standards development and habitat operations teams, resolves societal decision spaces.

In a standard community-based societal decision system, the decision comparator releases the solution into operational tasking (Read: execution) at 99% confidence (based on threshold stopping rules), and not 100%, because the integrator is still looking for around for further information (i.e., that 1% uncertainty), for risks and optimizations to decisioning outcomes.

In the market, independent inquiries are required to validate and provide assurance assessment. In the market, competing entities have production secrets. In community, all production is transparent, all decisioning is transparent, and all worker accountabilities (under the metric of human-need fulfillment) are transparent.

1.5.2 Parallel value inquiry

A series of parallel value-objective-requirement analyses conducted on any given solution:

1. **Conceptual assessments** of the solution in relation to the concept of freedom:
   A. Freedom.
      1. User socio-technical alignment.
      2. User demand surveys (need and issue surveys).
      3. Preference surveys.
      4. Contribution surveys.
2. **Operational assessments** of the solution in relation to the concept of justice:
   A. Justice.
      1. Distributed access operations: When plans are calculated and decided, they are done so in a manner that equally meets everyone's life phase needs for human fulfillment within a stated threshold.
      2. Restorative justice operations: When plans have socio-technically informed procedures that de-escalate violence, restore well-being, and reduce future harm.
3. **Computational assessments** of the solution in relation to efficiency:
   A. Statistical certainty/confidence and significance analyses. Statistical resource usage optimization.
   B. Economic resource plan matrix analyses. Solution resource plan optimization.

1.6 Stopping rules inquiry

A.k.a., Stopping rules, the stopping rule inquiry.

In the context of decisioning, "stopping rules" refer to predefined criteria or conditions that determine when a decisioning process or analysis should come to a halt, and a final decision should be taken. The idea of when does a decider stop acquiring and analyzing information, and commit to a choice, is itself a fundamentally import decision when taking decisions. At some point every decider decides that enough information has been collected and analysed (out of all the information available) and commits to a choice. Stopping rules are used to guide decision takers on when to stop collecting information, conducting analysis, and thinking about a particular course of action, and take the final decision. These rules are essential for ensuring that the decisioning process is efficient, avoids excessive resource expenditure, and leads to timely and effective decisions. Stopping rules are a vital component of structured decision-making processes, ensuring that decisions are made in a timely, cost-effective, and risk-aware manner.

No one needs to acquire ad infinitum information before a decision is taken. If that was done everyone would be stuck in choice paralysis, forever. Rather, with every decision, the decider only looks at some subset of all of the possibly available data, and with that, conducts appropriate analysis, and then, decides. With every decision, the decider's subset of information ought to get the decider over the confidence/certainty threshold, such that the decider can take a decision with sufficient confidence/certainty that the decision will be the right and optimal one. In other words, the decider ought to collect sufficient data and analyze that data so that the resulting information is sufficient for the decider to agree (give a statement of "yes") that there is enough information to state with sufficient confidence/certainty that the choice is the right/optimal choice. Here, to have certainty [that the choice is the right one] there must be enough data collected and analysis completed to reach a statistically reliable conclusion [that the choice is the right one].

The

Figure 27. *Icon representing a 'threshold'. In the icon, the arrow is moving downward and upon the third horizontal line down it reaches a threshold, which is indicated by the third line's downwardly concave shape.*

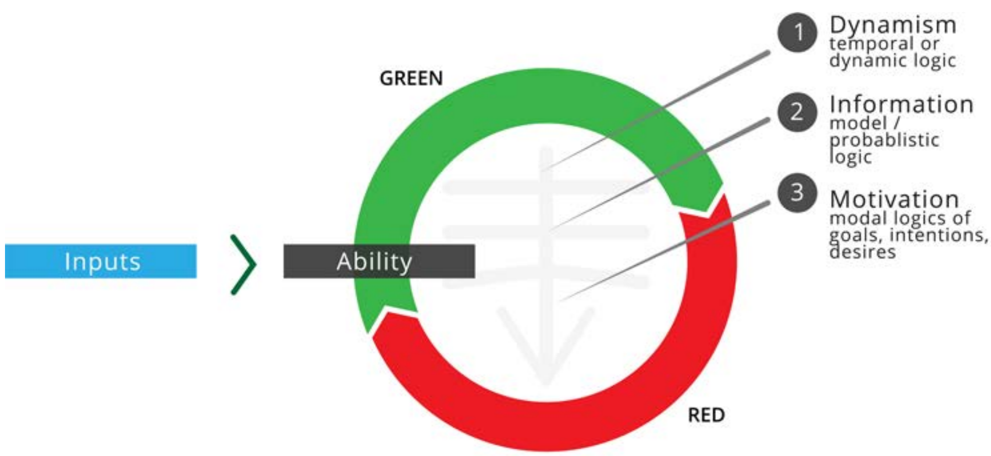

Figure 28. *Threshold [cap]ability to "go" (green) or "no go" (red).*

"stopping rule" inquiry asks,

1. When has enough information been collected such that the process of information collection can be stopped and a choice can be committed to?
    A. When has enough of a sample size [of the available information] been collected to unequivocally state that there is now enough evidence in support or in refutation of a hypothesis (in science) or a choice (in decisioning)?
2. When has enough information been analyzed such that the process of information analysis can be stopped and a choice can be committed to?

Note that stopping rules apply whenever there is a decision. For example, in the context of manufacturing, the question becomes, how many products must be sampled before the manufacturing process is "quality controlled", and before it yields too many defective products. In the context of the decision system's parallel process, When is it that each inquiry process in the parallel decision inquiry space has collected and analyzed enough information to stop and commit to a go or no go choice for the execution of a solution design selection (in the Solution Inquiry process)? Each parallel inquiry process, separately, agrees, or does not, to execute upon a solution/design via a rule completion process to allows the selected solution to be executed (constructed and operated); the rule process decides, based on its own sub-processes, whether the specific solution ought to be given the "go" (green) project phase re-categorization.

Here, thresholds (a.k.a., criteria, resolution scale) process information through a systematic forward node-like structure, and a set of final criteria/thresholds are met, that triggers the decision to stop, and a solution to be selected, or not, for execution. Here, it is relevant to note that stopping ought to take into account the principle of "diminishing returns". The "diminishing returns" principle states that there is a point at which gathering more information or analyzing further does not significantly improve the quality of the decision. There often comes a point when acquiring additional information does not necessarily lead to optimal decisions; instead, it is likely optimal to stop information acquisition if its cost (i.e., the cost of acquiring more information) is higher than its potential benefit (e.g., Edwards, 1965).

Importantly, after a decision is taken, it is essential to review the effectiveness of the stopping rules. If a decision does not result in the desired outcome, then the decider will need to adjust the rules for future decisions. This process is also known as feedback (a.k.a., review).

Stopping rule statements provide clear procedures for when to conclude a decisioning process based on specific criteria, thresholds, or external factors. Stopping rules can be established based on these various factors, including:

1. **Information sufficiency:** What is the most certain and sufficient body of information? Stopping rules may specify that a decision can be taken when a sufficient [threshold]amount of relevant information has been gathered and analyzed/integrated. Using statistical analysis, a decision might be reached when a certain level of confidence is achieved.
    A. Science constraints: Stopping rules about how much of a sample size must be collected and how must analysis must be done for the information to acquire a high certainty/ confidence calculation threshold.
        1. The decision space is not resolved until a certainty value is reached concerning the certainty of information based on the amount that has been collected as related to the total amount available.
    B. Temporal constraints: Stopping rules about how much of a time can be taken [as a threshold] until a decision must be taken.
        1. The decision space is resolved after a pre-defined/set amount of time has elapsed.
    C. Diminishing returns constraints: Stopping rules about how much data can be collected before a threshold is reach that determines that the further gathering more information or analyzing does/will not significantly improve the quality of the decision.
        1. The decision space is resolved once more information is unlikely to significantly improve the final decision.
2. **Resource constraints:** What are the resource constraints? Decisions may be halted when resource limits, such as energy, materials, time, budget, or personnel availability, are reached. This prevents overcommitment of resources.
    A. Preference constraints: Stopping rules about how many resources may be dedicated to any one or group of individuals and not pass a given constraint calculated threshold.
        1. The decision space is resolved once a individual preference and resource excess acquisition reaches a threshold.
    B. Cost constraints: Stopping rules about how many human / financial resources may be dedicated to any product/service and not pass a given calculated constraint threshold, thus denying further resource allocation and/or triggering the removal of resources altogether from the outputs of the decision process that has already occurred.

3. **Risk tolerance:** What is the tolerance to risk/hazard? Stopping rules can be based on predefined risk thresholds. For instance, a decision may be stopped if the perceived risks exceed a predetermined tolerance level. For example, a product may not be made, or made with a specific design, because it exceeds a predefined hazard threshold.
   A. Environmental risks: Stopping rules about how much waste/pollution will pass a pre-defined threshold of allowance.
      1. The decision space is resolved once a solution completes environmental assessment requirements to show it is in available environmental eco-service system limits.
   B. Social risks: Stopping rules about how much individual fulfillment must pass a pre-defined threshold of [human need] object and service access.
      1. The decision space is resolved once all individual human need fulfillment objects and services meets a required threshold.
   C. Safety risk: Stopping rules about how much individual and ecological safety is can be put at risk before a threshold of acceptance is reached.
      1. The decision space is resolved once the solution is determined to not exceed a human and/or asset/technology safety threshold (a set likelihood of harm threshold).
4. **Achievement of objectives:** In project coordination (a.k.a., project management), stopping rules may be tied to the completion/achievement of project objectives or milestones. Once an objective is met, the decisioning process (a.k.a., decision space) may conclude.
   A. The decision space is resolved once developers>alpha testers>beta testers>... have used the system and given its features and function a 90% satisfaction rate.
   B. The decision space is resolved once diagnostic testing has shown that the likelihood of some measured phenomena (e.g., *x* disease) reaches above 98%.
   C. The decision space is resolved once the model's accuracy does not improve by at least 100% after 100 hours.
5. **External triggers:** External events or triggers, such as regulatory changes, competition deadlines, resource accessibility changes, and market conditions, can also serve as stopping rules that prompt a re-evaluation of and or the requirement to immediately take a decision.

It is relevant to note here that in general the two largest factors in taking any decision are time (i.e., taking a timely decision) and the risk of taking an incorrect decision.

1.6.1 Sequential probability ratio test (SPRT)

The Sequential Probability Ratio Test (SPRT) is a statistical method used in decision-making processes, particularly in the field of quality control, to determine when to stop sampling and make a decision about the quality of a product or process. The Sequential Probability Ratio Test is particularly useful in scenarios where the cost of taking additional samples or the cost of making incorrect decisions is significant. It allows for adaptive and efficient decisioning while maintaining a predetermined level of risk.

The test involves the following factors:

1. **Hypotheses:** In quality control, there are typically two hypotheses, which are central to the SPRT:
   A. **Null hypothesis (H0):** This hypothesis represents the status quo or the assumption that the quality of the product or process is acceptable. In other words, it assumes that the product is conforming to the desired specifications.
   B. **Alternative hypothesis (H1):** This hypothesis represents the deviation from the acceptable quality. It assumes that the product or process is not meeting the desired specifications and has a quality issue.
2. **Sampling:** The SPRT begins with taking a series of random samples from the product or process being tested. For each sample, data is collected and a test statistic is calculated. The test statistic quantifies how well the observed data aligns with the two hypotheses.
3. **Decision rules:** The SPRT involves setting specific decision rules or thresholds for the test statistic. These rules determine when to make a decision. There are two key parameters in SPRT:
   A. **Type I error rate (α):** The acceptable risk of incorrectly rejecting the null hypothesis when it is true. This is also known as the significance level.
   B. **Type II error rate (β):** The acceptable risk of incorrectly accepting the null hypothesis when the alternative hypothesis is true. This is also referred to as the power of the test.
4. **Sequential analysis:** Instead of deciding after a fixed number of samples, the SPRT allows for a sequential analysis. After each sample, the test statistic is compared to the decision thresholds. If the test statistic falls below the lower threshold, sampling is stopped and the conclusion is that

the null hypothesis is true. If it exceeds the upper threshold, sampling is stopped and the conclusion is that the alternative hypothesis is true. If the test statistic falls between the thresholds, sampling is continued to acquire more information.

5. **Stopping rules:** The stopping rules are designed to ensure that the SPRT is efficient in terms of sample size and timely decisioning while controlling the risks of Type I and Type II errors. These rules are often based on the desired error rates (α and β) and the acceptable levels of risk in making incorrect decisions.

1.6.2 Selective stopping rules and p-hacking

A.k.a., Stopping rules and significance hacking, p-value hacking.

P-hacking, also known as data dredging or data fishing, is a deceptive and inappropriate practice in statistical hypothesis testing, research analysis, and decision analysis. P-hacking involves manipulating or selectively reporting data and statistical tests to a achieve falsely significant or manipulated result. The "p" in p-hacking stands for "p-value." A P-value is a common statistical measurement concept referring to the significance of observed results. It represents the probability of observing the observed results, or more extreme results, if the null hypothesis were true. A small p-value (typically below a significance level, such as 0.05) is often interpreted as evidence against the null hypothesis, and the findings are considered "meaningful". If the p-value is above the significant level (e.g., 0.05), then the findings are considered not meaningful.

P-hacking is the practice of manipulating or selectively reporting data and statistical tests to achieve a particular, often significant, p-value, even if the results are not genuinely significant or meaningful. P-hacking occurs when someone engages in various practices to manipulate the p-value or significance level. Some common p-hacking techniques include:

1. Collecting a large amount of data and then selecting and reporting only the results that show statistical significance.
2. Stopping data collection immediately when the p-value reaches 0.05; instead, of when an appropriate sample size has been reached. As a sample size increases, random error goes down.
3. Running multiple statistical tests on the same data until a significant result is found.
4. Trying different data transformations, subgroup analyses, or statistical methods until a desired p-value is achieved.
5. Removing outliers from the data without clear justification to make the results more significant.

In the context of Sequential Probability Ratio Test (SPRT), p-value hacking could take the following forms:

1. In an SPRT scenario, one could collect data, manipulate it, and then apply the SPRT without disclosing the data manipulation.
2. Someone could ignore the sequential nature of the SPRT, conduct post hoc analyses, and selectively report only those results that support a desired conclusion. This would be a form of p-hacking and would not adhere to the principles of SPRT.

2 Inquiry: Issue articulation

A.k.a., Need articulation inquiry, need inquiry, needs assessment, needs integration, issue as articulated.

All issues are representations of needing. This decisioning model is triggered by the articulation of an economic [design] 'issue', which normally includes a defined **need** with an accompanying set of **requirements** (or **objectives**) that must be attended to, to resolve the 'issue'. Issues are articulated (or "issued into") the *Issue Articulation Inquiry* sub-system by either an individual, a team of individuals, or a systems-based technical calculation sensor. The term, **issue**, as it is used in the context of this model is intended to mean: (1) the current unsatisfactory state of a system(s); (2) a potential problem or incident in the community; or (3) an economic inquiry within the community for restructuring and/or resources (transformation/transport). Technically, every 'issue' exists as a change request to the community and its systems, which have a continuing and iterative operational functionality. Herein, a specific instance of an issue may be understood in terms of its implied question(s) as well as the need (or want) that it fulfills.

The "issue" is a direct representation of user [human] need, as articulated into the decision system in a way the system can understand/interpret. In community decisioning there is no (or, insignificantly low) political "representation" where some human represents a territorial body of other humans in subjective decisioning; instead, the users represent themselves as both a human with [human] needs (i.e., human "rights") and a contributor with the desire/intention to do the work of meeting/completing human needs.

Herein, it is important to note that when an issue [instance] is created and "issued" into the decision system, the creator does not create the issue as a question. The questions that concern the nature of the issue are implied in issue recognition and further processing, which involve a set of commonly formalized, value-oriented design inquiries as well as a retention of the past dynamics of the system.

INSIGHT: *Questions provide the intention to focus. And, questions provide a focus for intention.*

This process of tracking the life and history of economic issues is known as **issue tracking**. The tracking of an issue extends throughout the life of the issue, and includes the issues **current status** (e.g., *ongoing*, degree *resolved*, and *assigned to*) as well as all additionally relevant data and information pertaining to the issue, and its inquiries. Issue tracking may also be said to involve the process of 'issue tracing'.

The issue articulation process feeds into a recognition inquiry structure, which generates the opening of a technical solution inquiry. The technical solution inquiry maintains a value orientation consistent of several sub-inquiry processes (e.g., economic, justice, etc.). While the technical solution space exists there concurrently exist an iterative design cycle that consists of: discovering issue requirements, formal specificationing, strategic preservation objectives, and the design itself. This exists within the state of continuous feedback with a larger information model. And, effectiveness inquiry functions to withdraw issues from active processing when they present a threshold of "risk".

Although different issues may have slightly different questions implied, the questions of issue **prioritization** and **allocated assignment** are [near] universally applied. And, they are often the first questions asked of an issue. In the case of a fire, the first implied questions are:

1. How should this issue (fire) be prioritized?
2. How should this issue (fire) be assigned (team & resource assignment)?
3. What resources are available or may be logistically arranged to become available to handle this particular emergency-issue (fire)?

NOTE: *These questions presumes that the potential for a fire was planned and designed for. These are planning questions.*

In the case of an emergency, the priority is the emergency and resources are systematically accessed under emergency response protocols by those humans and systems that are responsible and sufficiently informed to respond to and recover from the emergency.

No significant processing of the issue occurs during the issue articulation phase - issue articulation is mostly the pre-structured routing of issues. Some issues are complex, others simple. Some issues will require significant initial data input, while others are triggered by a sensor and are automatic. The '**user**' (which may be an individual or automated system) entering the issue may or may not receive a request for more information from the input inquiry process (i.e., the issue articulation inquiry system) in order to ensure an accurate triage decision by the next system, the Recognition System. To the user, the issue recognition system appears as a subcomponent of a Collaborative Design Interface (CDI).

The Issue Articulation Inquiry system processes information on the following questions, which it displays globally through its global user [design] interface:

1. What is needed?
2. What information do we have?
3. What information is missing?
4. How are we going to get the information we need?
5. What is the next step?

When issues are initially articulated they are associated with a Habitat subsystem and an operational process by the articulating entity. In other words, the initial articulation of an issue always comes with a particular habitat [**tagged/assigned**] set of associations. Herein, social and recreational issues are articulated with a Facility subsystem association. Life and Technology Support issues are articulated with their associated subsystem. This initial association of an issue within the structure of the Habitat system provides data for the issue's relational clarification and for an accurate triage decision [by identification of its particular localized operational process].

Demand for economic goods and services is represented through the Issue Articulation process and later through need and preference inquiries.

> **NOTE:** *Issue articulation necessarily includes issue detection. Issues can be detected dynamically/automatically via sensors, and also via surveys and assessments.*

Transparency in concern to the issuance of need(s) into the community's decision space will show [by degree and context] whether or not needs are being effectively and efficiently fulfilled.

There are many issue tracking systems in existence and issue tracking is a field of [logistical information] study unto itself. Issue tracking is also sometimes known as: bug tracking, solution tracking, trouble tracking, and requirements tracking among having many other labels, including, information logistics (i.e., the flow of information). There exist a wide-variety of issue tracking systems on the commercial market.

There are some economic issues which may not immediately enter the value-orienting common decision space after pre-structured processing the issue inquiry system. For instance, if a fire were to break out, someone would not input, "how should this fire best be collectively handled?" This would be a non-sensible recipe for disaster. Instead, the community knows things about fires and it knows things about its structures, and so it might intentionally design its material habitat systems to trigger a sensor alarm, triggering an issue instance, leading to issue recognition and the activation of emergency services, which have pre-designed evidence-based protocols/practices. Evidence-based means the evidence came first. An evidence-based practice (EBP) approach is followed by emergency services world-wide. Also, we have the ability to install "smart" alarm systems to generate issue instances [when they detect the signature of a fire in the environment]. And over time, as we gain more knowledge about materials and fires, then we might be able to design our material architectural structures so that they are safely resistant to fires, which is itself an articulable design issue.

When we begin to ask people (our community) what they need and want, then we can begin to re-design our lives and our habitat to fulfill those demands [by individuals operating within a common social-technical-ecological-space]. Under the impact of a need we can begin shifting our [bio-physiological] structures to optimize our overall fulfillment [frequency].

> **INSIGHT:** *All demands are requests on the natural environment; therein, a command[ed demand] is an unfortunate form of request[ed demand]. Data collection and analysis is required to resolve all issues. Some issues require material changes to occur. Both use resources to resolve issues.*

2.1 User survey inquiry

> *A.k.a., Demand inquiry, user need assessment, consumer survey inquiry, needs survey, needs inquiry.*

The primary category all users have issue with are those of human needs. A user survey conducted on some cyclical (or ongoing) basis assesses the current state of need (requirement) for the population. A consumer questionnaire is the deliverable of the social statistical information decision system working group (a.k.a., production council, city planning commission), who inquires into, collects and accounts for data on what humans need (require) as an individual and/or family, on a multi-year (generally, 3 years) habitat master-planned basis.

Fundamentally, habitat populations make proposals via surveys of what they need and prefer produced. Local decision working groups in conjunction with the global decision system, plan the next production cycle for each local habitat (or regional habitat network).

Information can be acquired from users as to what is needed to be produced in the following ways:

1. **Survey user needs** - need can be determined before access, as the surveyed selection of a product (of set quantity and quality) over others. Individual members of society and families can identify some number of months ahead of time what they will need.
2. **Survey user preferences** - preference can be determined before access, as the selection of one surveyed customization of a product/service over another.
3. **Survey actual selection (i.e., survey use)** - preference can change after people start accessing (after production cycle is going and people are getting) for the selection of one customization of a product over another. Production can be "flexed" to produce more of what is in demand from an access warehouse (common-to-personal access area). Flexible production has more to do with specific user objects. Production can be designed to be flexible for preferences. The production unit looks at the stock and then adjusts product to produce more of what is being consumed most.
4. **Survey operating habitat service systems (i.e., survey production)** - survey the operating habitat

on both the contribution and user side so that the next iteration of the habitat is better than the last. Each habitat in the network is fixed to some habitat-level re-production masterplan (every 3-5 years, for example).

INSIGHT: *Local custom[ization] gives people back their freedom and control.*

3 Inquiry: Issue recognition

I.e., Issue as recognized by the decision system, given all internal, and meta-information, at the time of submission.

The Issue Recognition sub-system functions to identify, further define and clarify, and triage issues. The primary input of the Issue Recognition System is the issue itself and all associated [meta]data. The issue recognition system may request additional information from the individual or system that articulated the issue; and, it may pull information from other domains (or systems) in the Real World Community information system to ensure an accurate triage decision. The primary function of this phase is to process articulated issues under the condition of situation awareness (i.e., a knowledgeable context) and arrive at a triage decision. In concern to project initiation, if resource requirements and production costs are known, then a 'project' can form around the resolution of an issue. Issue recognition represents the initialization of a requirements management/coordination space for the issue. Issues have to be interpreted in the context of the situation just like diagnostic tests have to interpreted in the context of the patient/situational information.

Significant processing of an issue may or may not occur during this phase. An emergency, for example, would not require significant processing, and would follow a path leading to the immediate activation of emergency services. Multiple issues on the ongoing design of a product submitted by separate individuals might require more processing as some issues may need merger and others deletion (due to duplication). Processing depends upon the particulars of the issue itself and the context (i.e., situation awareness) within which the issue was submitted. Situation awareness is required for the orientational accuracy of all decisions and actions -- all decisions happen within the context of a situational [set of circumstance dynamics].

The issue recognition system functions to:

1. **To identify** (i.e., recognize, verify and confirm) the issue: Does this newly input[ed] issue match with what we know of the characteristics of known issues? In what ways does it match to those issues that are currently in or have passed through the decision space? Is it a "New issue" (a verifiable issue that does not match with existing issues as acknowledge and accepted as valid)? Is it a "Issue merger" (merge with existing similar issue)? Is it an "Issue rejection/dismiss" (issue is a duplicate or user error, and will be rejected and new relevant information if available passed to the original).
2. **To recognize** the issue's most relevant Habitat systems association (the habitat support system) and priority (the operational process) via a series of

routing rules relating to the current structuring of the Habitat.
3. **To clarify** the issue such that sufficient analytical understanding leads to an accurate triage categorization.
4. **To triage (prioritize)** issues along an urgency spectrum.
   A. Human life:
      1. Emergency.
      2. Medical.
      3. Restorative justice.
   B. Habitat life services (habitat life support operational teams):
      1. Water, power, food, etc.
   C. Habitat exploratory services (habitat exploratory operational teams):
      1. Recreation, education, science, etc.
   D. Societal information services (standards and decisioning working groups).
5. **As a recourse space** where flagged, modified and resubmitted issues are processed.

The Issue Recognition Inquiry process accounts for an issue's "situation awareness" (context). There is a large body of research literature surrounding the study of situation awareness. Situation awareness is defined herein as the collected perception of elements in the environment within a volume of time and space, their identification and the comprehension of their [related] meaning, as well as the projection of their status in the near future (i.e., 'trending'). Situation awareness involves the gathering of knowledge and understanding about the context of an issue from the environment in order to more greatly and accurately inform a decisioning process.

In the process of recognizing an issue, this inquiry phase associates the issue with relevant data from every other system and domain in order to accurately place the inquiry into the larger inquiry system (Read: the common value-orienting decisioning space). Situation awareness is always a fundamental requirement in order to take any form of 'informed action'. Every issue has a requirement for situation awareness while it is in the decision system, for this is an integrated system - a system-system.

3.1 Primary habitat operational processes

In order to appropriately triage an issue, the issue must be recognized. Issues contain requirements that must be met for their resolution, and these requirements play an important role in the Recognition Inquiry's triage decision. An issue's requirements are prototypically processed into one of the three primary habitat operational process categories:

1. **Incident response (a.k.a., highest urgency)** - is generally characterized as an unforeseen event or circumstance that either disrupts regular operations or has the potential to do so, and is or may pose a risk to safety and security. Incidents are either initially associated with, or later directed into, the Incident Response 'operational process' category. The general prioritized classification of classes of incident response tasks and outcomes is:
   A. **Emergency (tasking phase of incident; operations failed)** - refers to a sudden and often unexpected situation or event that demands immediate attention and action. It typically involves a threat to life, technology, or the normal functioning of an organization. In incident response, the emergency phase (of tasks and outcomes) focuses on addressing the immediate and urgent aspects of an incident, such as ensuring the safety of individuals and stabilizing the situation.
   B. **Critical (tasking phase of incident; operations continuity)** - refers to a serious issue that without care could become an emergency issue. Note that the word "critical" also typically refers to the severity or importance of an incident or component within an incident. It signifies that something is of vital significance and requires special attention or resources. In incident response, critical elements are those that have a substantial impact on an organization's operations or security and need to be addressed with the highest priority.
   C. **Recovery (tasking phase of incident; operations strategic continuity) -** refers to the process of restoring normalcy and functionality, continuing operations after an incident or emergency. The recovery phase focuses on getting the organization back on track and minimizing the long-term impact of the incident.
2. **Operations and maintenance (O&M urgency, or maintenance and operations, M&O)** - The 24-hour activities that are required to operate a system, as well as those activities associated with construction, production, maintaining/servicing, and re-cycling.
   A. **Operations (tasking phase)** - refer to the set of activities, processes, services, and tasks that an organization (socio-technic) carries out to effectively and efficiently execute its core functions, deliver services, and achieve its objectives. Operations encompass the day-to-day work and execution of essential activities required to meet an organization's goals efficiently and effectively.
   B. **Maintenance (tasking phase)** - refers to the

systematic and planned actions taken to preserve, repair, or sustain the condition and functionality of assets, equipment, infrastructure, or facilities. It involves activities such as inspections, repairs, cleaning, and periodic servicing to prevent deterioration, ensure safety, and extend the operational lifespan of the items or systems in question.

C. **Construction (fabrication, assembly and integration phase)** may be seen as an operations sub-task, and not a separate "industry" as categorized in the market-State. Instead, habitat technical operators sometimes construct, sometimes maintain, and always operate.

3. **Coordinated master plan decisioning (a.k.a., master planning urgency, strategic preservation planning, planning preservation, coordinated masterplan decisioning)** - refers to the activities associated with planning strategic access (long-term, generational access) to fulfillment services and common heritage resources within habitats (Read: societal decisioning) in the form of master plans. Strategic preservation planning is a process/ phase that involves developing, deciding, and implementing a projects for the preservation, protection, and sustained access of common heritage habitat services over the long-term. The strategic preservation planning phase (a.k.a., the Decision System) produces a master-plan for both society as a whole, for the societal specification standard (SSS), and for every individual habitat, within a network of community habitats. The purpose of the Decision System is to produce a master-plan for the coordinated integration of information and physical work in the form of a network of socio-technical habitat service systems operating at the local- and global-levels for human fulfillment. The decision system is the strategic planning system. A plan is a decision system at a higher level. An economic system is a decision system at a higher level. All economic systems are planned/decided; some for market-State values, and others, for community values.

NOTE: *All operational processes are categorized, ordered, monitored and controlled, by a contribution service system composed of teams made up of people and machines.*

All issues are sorted via these operational processes - a sorting algorithm exists to sequentially order issues based upon the primary operational processes, and may include additional qualifiers, such as:

1. The degree and complexity of internal consensus of the issue's originating group(s).
1. The reputation of the individual or accumulated reputation of the group.

3.2 Incident categorization

Prioritization of incidents relates the importance of the incident to the impact on the organization and the urgency, relative to the timing of the incident (that is, when the incident occurred). Categorization is the process of arranging the incidents into classes or categories. In the incident coordination process, this provides us with the ability to track similar incidents related to the products and services provided to the organization.

When an incident is first categorized, it enables the analyst to run a search for knowledge in the form of incidents, problems, or known errors. When an incident can be categorized in only one way, the search against previous knowledge is more effective. If knowledge is not available, categorization provides the structure to begin gathering the information necessary to diagnose and categorize the new knowledge. Categorizing the incident speeds up the process and creates greater efficiency within the process flow. If an issue cannot be resolved, the next value-add of categorization is identifying the group(s) to which a given incident can be escalated. Once escalation groups have been tied to specific categories, the organization can begin eliminating errors in the escalation process. Finally, another benefit of effective categorization is the ability to produce meaningful reports and conduct trend analysis, which helps the organization take a more proactive approach to managing services. Event management also depends directly on incident categorization. Developing automation tools and features that support event filtering and correlation, which will help you identify incidents and select the appropriate control actions, is important to ensuring the success of a given process. Likewise, proactive problem management is nearly impossible to achieve without good categorization. If an analyst can log a single incident under five or six different categories, just imagine trying to run a master report that includes all of the incidents and reports related to a specific service, issue, or component. Such a report might identify some similarities between incidents and problems, but without the full picture we may not be able to conduct trend analysis. Categorization is based upon a hierarchical structure that has multiple levels of classification. The hierarchy is often described as a category/type/item (CTI) structure. Once the analyst picks a high-level category, he will next select a type, followed by an item. If this is done effectively, the category defines a subset of types and the selection of a type identifies a subset of items. This type of hierarchy simplifies the incident categorization, reduces error, and helps tie unique CTIs to their owners. At its core, then, categorization is like a set of buckets. Each bucket holds a bunch of incidents and these incidents are logically grouped according to a subset of characteristics. The first decision to make has to do with identifying the highest level of the hierarchy.

> **MAXIM:** *What we refuse to see is what can most hurt us, because we have no defense against it.*

3.3 Issue escalation

Critical issues are those that affect dates, budget, or quality of "must have" deliverables, if not addressed.
Escalation must be managed, documented, and timely. When an issue has been escalated, the escalator must continue to monitor the situation and report on the progress of the resolution.

The following escalation process will be used:

1. **1st level escalation** is notified in case of a critical issue if the issue cannot be resolved at the functional or project level. Otherwise, the situation will be handled and documented.
2. **2nd level escalation** will be notified, if the first level does not or cannot respond, or response is insufficiently handled and documented.
3. **3rd level escalation** will be used in emergencies only.

3.4 Systematically recognized and integrated needs

Every issue is assigned and prioritized. Human life support needs acquire a different prioritization than human social and recreational needs (or wants) and this is a commonly agreed upon and fundamental moral (or ethical) understanding. For example, while a human may *want* a car, he or she does not *need* a car. A car is not something required for survival or optimal maturation. However, a car may serve as a tool that helps an individual living today meet genuine needs. For instance, a car may help someone travel to see friends, meeting the need for connection. Or it may be used as transport to an office where money is made and subsequently spent at a distant business to meet the need for [at least] food and shelter. Thus, the car is part of a need-meeting strategy, but is not itself a need. And, from a systems perspective the need is not the car; instead, the need is for a technologically efficient and humanly effective transportation system within an integrated habitat service system which designs the fulfilled integration of all knowable needs [simultaneously in space and time]. Every car on a road is in fact part of a larger system, a transportation and distribution system, which is interrelated with a social and economic system [as well as a material architectural system].

Herein, the Community recognizes and measures those things that are essential to the sustainment of biological life and human well-being. These basic life supporting necessities include, but are not limited to: the need for uncontaminated food and water (and nutritional density in the case of food), the need to shelter and to clothe (environmental exposure), the need for energy, and the need for a restorative environment (e.g., sleep). These are not luxuries, they are not wants, and they are absolutely essential to the survival of an individual and a community.

We experience life supporting needs as different (or separate) from social and recreational needs (or wants), with the recognition that both are necessary for long-term individual and social well-being. Social and recreational goods and services allow for relaxation, re-creation, and personal and social development. Social and recreational needs are essentially an extension of "quality-of-life" [technological information] needs, sometimes known as "wants". Fundamentally, all [healthy] humans have desires beyond basic needs. If this were not true then there would be no self-driven inventors, designers, or artist.

Biologically healthy humans exist because their life support needs remain sufficiently met. Life support needs are identifiable and measurable, and nowhere is this more apparent than with those other species that we share a close connection: cats; dogs; horses; plants; and other many lifeforms. Clinical animal researchers are exceptionally well informed (due primarily to an accumulation of scientific studies) about what macro and micro level of nutrition these species need to stay alive and biologically healthy. In other words, in clinical animal research nutrient lists exist for various species and provide helpful data in animal models of disease and performance (e.g., race horses).

Living beings must live congruent to their biology at all times [qualified by hormesis] for optimal health and well-being. "Primitive societies" (i.e., indigenous peoples), though few still exist, were known to be highly aware of their resource requirements necessary to meet their absolute needs, because even slight alterations in the environment could reduce their probability of survival. These societies would logically have spent great effort identifying those foods (i.e., complex nutrient substances) and biologically-sustaining resources that were life-promoting, as well as those substances that were poisons; and, they would have designed their diet and lifestyle around their understandings.

The confusion of needs and wants is one of the most destructive conceptual forces in modern culture. It is part of the basic pattern that underlies addictions of all kinds. By continuing to focus energy on meeting a perceived need that doesn't exist (i.e., a pseudo-satisfier) or that is actually already met, ignoring natural limits, and simultaneously neglecting to meet other important needs, one creates and maintains imbalances and wounds, diseases and infections. Hence, it is important to clear away a lot of the programming around wants that limit us from sensing our real needs.

Human need (or 'life need') is that without which 'life capacity' is reduced. A need is something that is essential for life functioning. *Life capacity* is the experiential expression of your consciousness in the material probability space. Essentially, life capacity refers to someone's potential to experience, to perform (or effect[or]), to design, and to create in the real world. 'Need' is expressed here distinct from 'wants', which are uniquely related to the life experiences of the individual (i.e., the conditioning and cultural environment), but not directly related to the survival of the individual's embodied life. The fulfillment of some needs are essential for basic biological and psychological life survival, and when they go unfulfilled in a society, then biological and behavioral corrosion appears. Herein, biological corrosion refers to all states of disease, not just chronic states of diseases and non-communicable diseases.

From a systems perspective there exists a spectrum of life needs common to all human systems on the planet regardless of social identity (race, creed, religion, region, nation, tribe, or social class). These needs reference the empirical life-ground that is shared by every human being and may become known to some identifiable and measurable [emergent] degree. When it comes to needs, what is generally accepted today is that monetary economics and all its many market entities, and even the State, all represent the pinnacle form of social organization for bringing prosperity and well-being to the masses, for meeting needs. In order to claim that title from a systems perspective you have to account for the whole system in an integrated manner, and you must at least account for life capacity, human behavior, expressed and real needs, and environmental resources - none of which are effectively accounted for by a monetary economic system. In a market system all basic human needs are commodified by entities competing for [at least] market share ... even sleep (a basic human need) is a commodity (e.g., hotels).

Before acquiring an opinion on the subject of absolute human needs it would be wise to take a primitive survival course to more greatly experience the difference in a biological need versus a social or recreational need (i.e., wants). If "you" have lived your entire lifetime in domesticated early 21st century society then it may be more difficult for "you" to understand this empirical notion (i.e., the inferential difference between your experience and the experience of someone who understands this is great).

If "primitive societies" were sufficiently providing for their own needs, such that dis-ease was minimal or non-existent, then it should be no great stretch of the imagination to comprehend that with our modern understandings and technologies we can meet our life support needs and far exceed the wants of individuals in our community, and do so sustainably. It appears unnecessary then to prioritize life and technology support needs beyond that which we know are absolute for our healthy biological functioning (i.e., beyond 'incident response' status).

People will violate their own values to meet their needs. They will find a way out of survival, and it isn't always pretty. Remember this when judging another. In your own life, what triggers your needs so deeply that you will do the most monstrous things to have them met?

The differentiation between life needs, and social and recreational needs is not intended to demean the cultural pleasures and creativity of expression that foster enjoyment in this life, but to ensure that there does not exist a distortion of values and priorities. In some distorted systems, "all animals are equal, but some are more equal than others [in the fulfillment of their needs]". Such a distortion will eventually lead to the "negative sustainability" of a community.

One life supporting need cannot be valued over the other (e.g., valuing shelter over food). They are all essential, and that is why they are classified as 'needs' versus "wants". As our knowledge and understanding of our primary four (+2) needs (shelter, water, energy and food + a restorative and recycled ecological environment) grow so too will the way in which they are met by the core support systems that we design to meet them.

There is no great dilemma in concern to the prioritization of needs themselves. Needs are prioritized over wants and the community maintains an emergent and empirical understanding of the threshold at which a need is no longer being met, causing aberrant biological and potentially psychological functioning, or environmental damage. Fundamentally, this can be summed up in the statement that our needs cannot be decoupled from nature (or, over-layed by pseudo-satisfaction), and that if they are (or were, as the case may be), then we would eventually lose an awareness of what those needs actually are. Maybe, this is something to ponder about the notion of "domestication".

> **QUESTION:** *Are the necessities in life being manufactured to sustain an economic system, or to sustain the healthy functioning of individuals within a healthy functioning society?*

3.5 The triage process

> **INSIGHT:** *Some needs are more "costly" to a society than others when resources are limited.*

'Triage' is a [medical] term referring to the process of prioritizing issues [patients] based on the severity of their condition so as to maximize benefit (help as many as possible) when resources are limited. Herein, **Issue triage** is the process of *sorting* and *categorizing* issues based upon their *urgency* and their *likelihood of impacting the stability and functioning of the Habitat system.* The process of triage is the process of prioritizing those issues that are of an urgent nature over those issues that are not urgent.

In order to understand the triage process the Habitat support system architecture must first be understood. In brief, the system architecture involves three principal service support systems (i.e., life; tech; & facility) that function to meet needs and wants, and to fulfill [life] purposes by providing goods and services to individuals in the community via a set of formally defined processes. That support structure is then integrally divided into a series of three operational processes that maintain the service systems' ongoing existence. The operational processes, in turn, reference an infrastructural system that maintains the material *components* and requisite *tasks (or "tasked technologies")* for the habitat service system.

During the triage process issues are sorted and categorized, which involves the process of prioritization, based upon their pre-defined (and planned) urgency to the community. **Urgency** distinguishes the impact of an issue relative to the operation of the Habitat's systems and the safety of life. Urgent issues are assigned to those systems and interdisciplinary teams that are responsible for the systems involved and have the knowledge, capabilities, and skill [expertise] to solve the issue in a timely and safe manner.

'Priority' refers to the concept of 'precedence'. Certain issues for a transparent, specified and strategically rational reason (or sufficiently inquired explanation) are given attention first -- 'urgent' status issues are given priority by the decision system. Issues are prioritized by factoring in a number of variables including but not limited to: the habitat system(s) to which the issue is assigned; the issues associated operational process; the issues requirements; and information about the issues situation awareness, which includes the availability of resources.

Some needs are more urgent to a community than others. For instance, when members of the community are malnourished, the cultivation of nutritional food (System: Life Support > Biological Nutrition) has more urgency than the production of golf clubs (System: Facility > Recreation). This empirically referential form of prioritization represents the first encoded layer of the value of 'justice' as the effective fulfillment of human need.

Costs come in many forms, such as the cost (or artificially imposed limitation) to: efficiency (a *technical constraint*); self-directed freedom and autonomy (*social constraint*); the cost to our environment (*resource constraint*). There is also the production cost to other goods and services (an *economic constraint*). Costs can indeed be independently measured, and rendered calculable in a common material habitat. And they can be used [by contextual degree] to facilitate a triage decision.

Here, resource-based economic calculations and logistical operations provides a guide amid the bewildering throng of economic possibilities. The resource cost to all access/use issues are calculated in parallel real-time, enabling a community to prioritize outcomes through a value encoded system (with a value-encoding mechanism/process).

Priority issues have the ability to impact system instability (though not immediate instability). Those individuals that work directly and are responsible for the stability of a system are best able to guide these issues to a satisfactory resolution. If a system becomes unstable it could lead to the destabilization of every system, which would ultimately impact our needs and our survival.

Some issues will resolve with no cost, minor costs, and others, major costs, to how other needs are met with the availability of resources. For instance, a critical issue in the life support system may have a major resource cost to the ongoing production of a research device for studying some unassociated phenomena. In this case, the critical issue receives priority allocation of required resources until such time as the system is functioning nominally once again, and then, resources are transferred to the original priority, the research device.

The *Issue Recognition* system recognizes seven **prioritization designation** (or **assignment**) categories for issues. These seven categories are organized into an **urgency spectrum**. Five of these seven categories represent degrees of urgency, and the other two are considered "non-urgent". Higher urgency issues are prioritized (i.e., given priority) over lower urgency issues. Planned criteria exist for all urgency assignments.

Higher urgency issues involve the risk to life as well as the unstable or malfunctioning states of a system. The unstable or malfunctioning state of the core systems (i.e., life support and technology support) and risks to life are given priority over facility system issues. Higher urgency issues generally involve multiple systems; it could be said that every issue involves a spectrum of systems.

The urgency spectrum also accounts for systems that require a continuous and ongoing supply of resources: the incident operational processing; maintenance operational processing; and strategic operational processing structures. These **operational processes** are part of the core of the habitat systems' infrastructure and exist to maintain a state of habitat homeostasis.

Every physical system exists in a world of changing conditions. To remain functional (or functioning), a physical system must keep the conditions inside of itself fairly constant. A system must have ways (e.g., mechanisms of action) to keep its internal conditions from changing to its detriment as its external environment changes. This ability of all living things to detect deviations and to maintain a constant internal environment is known as homeostasis. To maintain homeostasis, systems must make constant changes. This is why homeostasis is often referred to as maintaining a dynamic equilibrium [dynamic means "active" and equilibrium means "balanced"]. Homeostasis requires the active balancing of priorities.

> **NOTE:** *There is only a finite number of options concerning the use of inputs that would lead to their efficient allocation; whereas, there is an infinity of options that would result in those same inputs being mis-allocated.*

4 Inquiry: Risks and concerns

A.k.a., Effectiveness inquiry, hazards inquiry, concerns inquiry, safety inquiry, harm inquiry, project risks analysis, caution analysis, danger analysis, serious constraints inquiry.

After the issue has been recognized by the Issue Recognition Inquiry process, then Effectiveness Inquiry immediately comes into effect. Effectiveness is the degree to which goals (or objectives) are achieved. Thus, Effectiveness Inquiry refers to the process by which all issues are continuously assessed in terms of their ability to hinder at least one of the community's goals (or, corrosively impact the fulfillment human need). This inquiry process asks: Will further performance of tasks as requirements of this issue's resolution hinder the fulfillment of at least one of the community's primary goals. Also, how will the continuation of effort toward this issue impact our social direction: our purpose, our goals, and our needs? This inquiry process is effectively a continuous environmental inquiry to determine if continued effort toward resolution of an issue is a serious risk and concern to asset integrity (Read: habitat objects and services) and human fulfillment (Read: human needs completion). If an issue is found to have created, or has the timely likelihood of creating, serious harm, then this continuous issue tracking effectiveness inquiry will remove the issue from having further action taken upon it, until the serious concern is sufficiently controlled, mitigated with no harmful residual (after mitigations) risk.

Effectiveness inquiry is a continuous safety-check. All decision inquiry processes are processes of acquisition and integration; this inquiry process seeks to remove harm [to human need fulfillment and ecological regeneration] through removing from circulation integrations that may harm fulfillment. Here, a criteria checklist is used for the discovery and exclusion of formal designs and/or resource expenditures that exceed acceptable standards.

Effectiveness inquiry asks whether the solution and the process to develop and operationalize it is safe (physical safety) and effective (sustainability):

1. What are the serious risks associated with the continuation of a project that could put the community population and/or its informational-material systems at serious risk?
2. What is the threshold of seriously concerning risk, as impact, probability, and certainty, and what is the societal standard for its acceptance (as a numerical, categorically counted value)?
3. Is a solution in-effective at preserving human well-being and sustaining human fulfillment?
4. What evidence would be sufficient enough to stop the continuance of a project?
5. Is the resource dedication to the resolution of this issue excessive?
6. Do the requirements for resolving the issue, or the solution itself, put the safety of anyone or any [informational-material] system at serious risk?

Effectiveness Inquiry represents a continuous process of inquiry throughout the life of every issue in the common decision space. If at any point in time the issue's tasking resolution meets this 'effectiveness threshold' by the answering of these questions in the affirmative by either the community, a technically automated system, or a technical interdisciplinary systems team (in the form of threshold agreement), then continued action on the issue will cease. 'Threshold agreement' demonstrates (or evidences) that those with the greatest responsibility for (i.e., systems' teams), or users of (i.e., the community), the systems that maintain the community's existence have the current transparent evaluative risk appraisal that continued action on the issue is likely to damage the effectiveness of community systems in fulfilling the community's purpose; for, at the highest-level the community is held together by a purpose, which is in turn identified by a set of rational and relational goals, objectives and tasks. In a sense, everyone in the community is responsible for continuously assessing the risks that issues pose. In particular though, the lead interdisciplinary team of a particular sub-system is tasked with the continual assessment of the risk impact and risk probability associated with an issue.

INSIGHT: A *healthy functioning society requires individual participants with a healthy functioning value system.*

Effectiveness Inquiry involves three primary dynamic inputs:

1. **Technical effectiveness** - systems are encoded with safety buffers that "table" issues (i.e., put on hold) that have the potential of damaging their technical system. Some automated systems can change the status of their own continued operation based on the programmatic processing of sensed feedback from an environment.
   A. Is the system still technically feasible?
2. **Supra-system interdisciplinary team effectiveness** - threshold agreement amongst a specifically assigned team can put an issue on hold.
   A. Is the system still viable?
3. **The community** - a threshold agreement can put an issue on hold.
   A. Is the system still desirable?

If any one of these three continuously inquiring systems identifies a threshold of risk, then the issue enters into a holding pattern (i.e., "put on hold") outside of the decision system. In other words, it is assigned to urgency : prioritization > deferred. Issues within a holding pattern may only exit the holding pattern via another threshold agreement by either the interdisciplinary team or by the community. This secondary threshold agreement will determine whether the issue is to be **closed**, **maintained** in the holding pattern, or **re-instated** into the economic system.

The process of Effectiveness Inquiry is known as "negative orientation". Those most familiar with the habitat system and expert areas that will be involved in future steps with the issue are also those most likely to recognize when actions will orient a the system against itself, against the community's purpose and goals. An issue that has a "negative orientation" for one subsystem may not have such an orientation for another subsystem, or the supra-system. In fact, it may be necessary for another systems continuation. This is particularly true in times of malfunctioning systems, and under adverse environmental conditions.

A community could even maintain a threshold agreement in the form of protocol that "pattern holds" issues which are known to put the community at risk.

A threshold agreement could come in the form of a vote with a threshold of 80% or 90% shift the pattern holding status of an issue. A one, two or three stage process could even exist. The interdisciplinary team leaders could achieve agreement, and then the community itself must achieve a threshold of agreement to put the issue on hold, or to re-instantiate an issue. The central variable, however, is their approach to social organization and the transparency of the information systems they use.

Please note that there exists the possibility that a community's orientation could be taken advantage for personal gain under any of the following conditions, which generally all encode concurrently when any one of them is encoded:

1. **Transparency** - Less than 100%, complete transparency of the system.
2. **Force** - An authoritarian, socially hierarchical organizational structure.
3. **Competition** - Where differential advantage exists (and conscience is reduced as a normal part of interpersonal relationships).

It is unknown as to whether or not this process of effectiveness inquiry could ever be mechanized to such a degree that it becomes fully automated. At this moment in time, it does seem like humankind would always have to be involved to some variable degree in the in this inquiry process to ensure the highest level of socially "negative oriented" feedback.

This inquiry process is designed to utilize the expertise of interdisciplinary teams in an attempt to negate the 'fallacy of composition' - the illusion that what is true for each part of a whole must be true for the whole. It is an error that overlooks the interrelationships between the different parts of a whole. From a systems perspective a complete understanding of a system cannot be derived from its reduced parts, it is only achieved by a perception of the whole system (Read: holism) to which all those parts belong. A practical approach to the development and maintenance of real world systems involves the application of interdisciplinary team effort.

Here, *Effectiveness Inquiry* necessitates the involvement of the interdisciplinary team(s) most closely involved with the issue, as well as the overall orientation of the habitat's systems (i.e., the systems for which they are accountable).

Effectiveness Inquiry functions to:

1. **To put 'on hold' continued action** toward the resolution of an issue that has met a threshold of likelihood to endanger the fulfillment of at least one of the community's primary goals. Also, the technical systems themselves can be designed to put 'on hold' issues that would knowingly damage their systems. And finally, the community of users and accessors put on hold continued actions that are likely to harm themselves.
2. **To reinstate or close issues** previously placed 'on hold' by a threshold agreement from some combination of the three sources.

In a sense, the three primary issuance dynamics into this inquiry process (the technical systems themselves; the interdisciplinary team(s); and the community) have a relationship to the urgency spectrum. Likely, it will always remain the case that some issues must be urgently removed from, and others, urgently re-instated into, common [decisioning] circulation. Remember here that in material space-time there is something known as 'localization' (i.e., there is spatial proximity). In a real world system, those safety mechanisms that are closest to the point of a failure or collapse have the technical potential (by contextual degree) in responding to the issue the fastest. Hence, something that has the potential to become a highly urgent issue very quickly, such as a fire, might want to be designed for in the construction of the habitat's infrastructure. For example, if there is a fire in an environment with some form of concentrated-combustible gas, then the a sensor would be present to automatically shut off and vacate gas from that approximate area [of the habitat service system]. Note that decisions could be partially said to rely on [technical] sensory instruments that are 'scanned' at regular intervals.

Please note that no belief in authority is required to maintain this negative-orientation threshold-check. Authority can be defined in the context of force, but it can also be defined in the context of knowledge "expertise", which is something of a misnomer. These interdisciplinary team experts have demonstrated expertise on the systems involved in ensuring that everyone's life and technology support systems are continuously met. No "rights" or "privileges" are being given or granted to this team of individuals. And, no 'access' is being granted to them that every other community member does not have the potential of developing. Anyone can become an interdisciplinary team member and participate. Further, all interdisciplinary team members use a common repository of information, and a commonly formalized approach to transparently inform their threshold decisions. And, everyone in the community has access to these same information sources. Herein, the term "expert" isn't necessarily accurate when there is always something new to learn and the "expert" knowledge an skills are potentially available to everyone.

Effectiveness Inquiry and the interdisciplinary team structure in general, grants no more freedom to anyone than anyone else in terms of access to needs, goods or services. Instead, this inquiry's sole purpose is to bring into greater inspection and clarification the continuation of issues that are likely to damage the systems of the habitat that provide for everyone's fulfillment. The interdisciplinary teams are not granted any more freedom [in this fulfillment] than anyone else. Essentially, no one, no system, and no process exists to grant any such additional freedoms.

Effectiveness Inquiry is not the process of forcing or coercing or marketing or exchanging an issue through the socio-economic system. It is neither the market nor the State. In fact, it is quite the opposite of both. As an inquiry process it attempts to represent reflective thought about an issue at a systems level (the systems themselves, the teams and the community). Everyone has the opportunity to looks at an issue in the decision space and says, "this issue needs greater clarification". We need more information about this issue before proceeding any further. And, the entire process why which this occurs is transparent and formalized.

Here, interdisciplinary teams are [in part] responsible for (i.e., have accountable tasks relating to) formally clarifying and assessing issues so that their tasks, resources, and risks are more visible to the whole community. And, they do this within an open, interdisciplinary habitat system. In part, interdisciplinary teams ask, "What is the possible effect of applying effort to this issue and its accompanying tasks? Will the effort damage the habitat and our community? To what degree will our goal(s) and purpose be hindered?" If a threshold of consensus is achieved, then essentially the team members are stating, "let us not continue (or continue) the pursuit of this issue at this moment in time, and we will re-address it when we have more information."

4.1 Triage

There is prioritization of operational resources to issues that are of a higher priority to human life and human habitat service. The priority is:

1. The highest priority is the shutdown of emergency services (and recovery).
2. The second highest priority is the shutdown of life support services (and recovery).
3. The third highest priority is shutdown of exploratory support services (and recovery).
4. The strategic highest priority is the shutdown of information system specification standards services (and recovery).

4.2 Effectiveness check

During the effectiveness inquiry process, concerns with the issue (information/object) are shared to collect objective disadvantages.

It is possible to test the effectiveness of an issue/proposal in the following ways:

1. Does the issue/proposal cause harm to the purpose of the working organization?
2. Does the issue/proposal cause harm to the accountabilities of the working organization?
3. Does the issue/proposal cause harm to roles in the working organization?
4. Does the issue/proposal introduce additional issues/concerns?
5. Does the issue/proposal necessarily cause the impact?
6. Is there an anticipation that the issue/proposal will cause the impact?
7. Will continuation of issue/proposal degrade the capacity of the community population.

4.2.1 Safety check

A.k.a., Check for harm.

Effectiveness (safety/harm) inquiry necessarily involves:

1. Is further integration and/or safety (error & harm) procedures required before proceeding?
2. What can be added or changed to remove the safety/harm/error issue?
   A. Would that remove the safety issue completely?
3. Would some solution still address the issue?
4. How will the harm be created by the issue/proposal?
5. Is the harm already a problem?
   A. Would it still be a problem if the issue/harm were dropped?
6. Is it likely that under normal operating conditions safety/harm may occur?
   A. Is there anticipation that the harm will likely occur?
7. Is there concern that significant harm could occur before adaptation is possible?
   A. Is the issue/proposal safe enough to try

(execute), knowing it can be re-visited in the future.

Effectiveness (excess) inquiry necessarily involves:

1. A collaborative and open decision system in community accounts for needs and allocates resources and contribution to produce and distribute access.
2. It is possible for people in community to take more than they are allocated or to violate usage protocols that would revoke access. Monitoring alarms are raised when something is taken beyond what is allocated by the decision system. The population of the local habitat (or, habitat region) would likely determine the level of monitoring (as deterrence, or just as safety).
3. If there is harm (and excess can be social harm), then restorative justice protocols are engaged.

Possible categories of harm that effectiveness inquiry can identify:

1. Time-related (inefficiency).
2. Material or material process damage.
3. Material or material process excess[ive] access.
4. Lack of clarity or comprehensibility.
    A. Harm to trust.
    B. Harm to purpose (goals and objectives).
    C. Harm to tasks (accountabilities and roles).
    D. Harm to individual accountability.

4.3 Resources space

> **NOTE:** *Reasons must be present, even if objections are not.*

Once an issue is the issue holding space, then an effectiveness 'recourse space' opens to allow for the issuer to effectively seek the re-introduction of the issue into the common issue solution circulation by resolving the issues internals problems that have caused it to be ex-filtrated from said circulation. Fundamentally, when there is disagreement, a better approach [than using coercive force] is to listen to what everyone in the community is saying and then try to incorporate objections as systems tests such that the system has to demonstrate (or "prove") that it is better than the current system.

> **INSIGHT:** *The most dangerous phrase in any engineering context is, "We've always done it this way."*

4.4 Uncertainty space

In an uncertain environment, as the real-world is, every decision involves uncertainty of 1% at the very least. In general, in community, decisions are best taken at 99% certainty, and the 1% uncertainty is a continuous search for inaccuracy.

5 Inquiry: Contribution

A.k.a., Contribution status.

The contribution inquiry status into a system solution could result in:

1. Red: No volunteer at the moment.
2. Orange: Insufficient volunteers, some scheduled periods are currently empty.
3. Yellow: Barely sufficient, all scheduled periods have volunteers but there is; insufficient backup/ redundancy or insufficient training for projected needs.
4. Blue: Sufficient volunteers with adequate backup/ redundancy and adequate levels of education/ training to ensure future (the status is an indicator).

The status of the contribution

1. Functional: Failure affects life support and/or technology support.
2. Services or Support: Failure affects quality of life and comfort.

The priority of the contribution (e.g., habitat service system operational process prioritization from life to exploration and incident to strategic) may include:

1. **Emergency :** Unforeseen incident requiring immediate action (e.g., fire, accident injuries)
2. **Essential services:** Power, Life support, Medical, Transport, Hydroponics, Communications (Failure causes immediate interference in other activities)
3. **Operational activities:** Main activity, failure jeopardizes or interferes with production and has a short-medium term impact operations
4. **Maintenance activities:** Occasional and instanced, medium-long term impact on operations short term impact on quality of life.
5. **Improvement**: Education, training material, R&D long term impact on operations.

When thinking of the number of people required to complete a socio-technical project, it is ncessary to think of contribution count in the following way:

1. What number of people is required to design?
2. What number of people is required to construct?
3. What number of people is required to operate?
4. What number of people will have to work for what number of years (and hours) to replace:
   A. The habitat's duplication equipment?
   B. The habitat's operation equipment?
   C. The habitat's light user common and personal production objects?

6 Inquiry: Feedback

NOTE: *Simple navigation errors can take a navigator increasingly more off course the farther s/he goes out. Navigators must maintain a state of continuous error-corrective feedback if they are to remain on course, on point, and on alignment with fulfillment.*

The decision process of any system must adapt to new information when it becomes available, otherwise the information model that informs the method is likely to become an increasingly inaccurate representation of the real world, and clearly, less rational. Decision feedback, wherein, feedback is error correcting feedback. The ability to adapt to new information when it becomes available is commonly known as strategic adaptation. If an entity does not adapt its total information set, and its decision process in particular, as it receives new information, then its decisions are likely to become increasingly unpredictable and likely less aligned with its desired outcomes. Imagine for a moment an archer who for several seconds before releasing an arrow toward a target (e.g., a purpose and goals), fails to account for the abrupt change in wind speed and direction. The final resting place of the arrow becomes unpredictable as soon as the archer stops accounting for incoming sense data about the wind. If it begins raining, the archer must now account for an additional input factor by which the arrow's aim is arrived at. At a socio-economic scale, accurate information is necessary for a stable and directionally oriented community. For information models to remain accurate, and thus, useful, their must exist a feedback mechanism. All issues with feedback are addressed by the societal information system, and decision system therein. Feedback is accounted for throughout (Read: anticipatory design); feedback is built into the societal program.

Feedback inquiry is the process by which data about the impact of decisions concerning the allocation of resources toward needed goods and services is fed back into the design of decision solutions as well as the future design of the decision system itself. In this sense, any change to the material environment whatsoever if fed back into the model that accounts for all information in the societal system. Note here that the term 'inquiry' herein implies that there is a active process of seeking or otherwise inquiring into feedback. In other words, feedback is a proactive process.

Feedback, for every habitat solution, whether it is responded to tactically (quickly) or strategically (e.g., next master-play cycle), is:

1. Collected, via:
   A. Intentional investigation (e.g., surveying).
   B. Observation (e.g., observing scheduling "consuming" products, observing comments).
2. Compared to expected need fulfillment and community objectives (analysis).

3. Integrated in a manner that adapts the whole system to a higher potential and lower entropy.

All feedback is aggregated as data into the Data Domain in The Real World Community Model before being integrated into the Knowledge Domain, which leads to the adaptive evolution of the direction and orientation of the community through iterative modifications to decisioning. Fundamentally, feedback allows for re-direction and re-orientation.

In this societal model, feedback about all changes of state and dynamic in the habitat in specific, and natural environment in general, is continuously fed back into the Data Domain by autonomous effort where possible and manual effort where otherwise. Feedback is a dynamic system requirement; it is required for the existence of an adaptive “living” societal system. Feedback ensures that decisions and actions are having the desired effects and ensures that future decisions account for all changes, whether expected or not, in the environment. If a population pays attention to effects (and affects), then it is more able to know whether or not goals are being attained, and also, whether it might be achieving that which was never intended and may not be desired. Fundamentally, living purposefully entails living consciously, and living consciously entails a willingness to accept feedback.

Decisions effect the environment, and in turn, the environment affects the decider (i.e., our decisions effect our environment, and in turn, our environment affects us and our decisions). Fundamentally, if a deciding system (or entity) seeks to improve its decisions, then it must revisit, question, and analyse its past decisions. The deciding system must be willing, and able, to explore the results of its decisions (in the context of its fulfillment) toward the improvement of its next decision space. Then, the whole system (of which the decision system is a sub-system) can be updated based upon new findings.

Additionally, by incorporating user feedback throughout the design of a system, it is easier to identify major problems or flaws at a much earlier stage. The cycle of evaluation, feedback, and modification should be repeated as many times as is practical.

> **NOTE:** *The brain is desperate to learn and upgrade itself if it only had the information and resources to do so. Neurofeedback research clearly shows that when a human brain has accurate and timely information about itself available to itself, then it can autocorrect itself. In other words, the human brain functions more effectively when it is more aware of itself, and neurofeedback technologies facilitate said feedback process. (Kvamme, 2016:14)*

6.1 Cybernetic feedback

Cybernetic systems are systems with feedback; they accept feedback and use it to control an environment. A first-order cybernetic system detects and corrects errors; it compares a current state to a desired state, acts to achieve the desired state, and measures progress toward the goal. A thermostat-heater system serves as a canonical example of a first-order cybernetic system, maintaining temperature at a set-point. There is also the conception of a second-order cybernetic system, which is a system that nests one first-order cybernetic system within another. The outer or higher-level system controls the inner or lower-level system. The action of the controlling system sets the goal of the controlled system. The addition of more levels (or “orders”) repeats the nesting process. A second-order cybernetic system provides a framework for describing the more complex interactions of nested systems. This framework provides a more sophisticated model of human-device interactions. A person with a goal acts to set that goal for a self-regulating device such as a cruise-control system or a thermostat.

It is relevant to note here that design (the internal solution inquiry process within the parallel inquiry process, herein) is a cybernetic process; it relies on a simple feedback loop: think, make, test, observe, improve. It requires iteration through the loop. It seeks to improve things and to converge on a goal, by creating prototypes of increasing fidelity. Design is devising courses of action aimed at turning existing situations into preferred ones; it is goal directed, and hence, intrinsically error correcting. Designs (and, designers) rely on feedback to exist and operate stably.

6.2 Feedback types

There are two general forms of feedback, negative and positive. There are several definitions for feedback in the literature. However, Bale (2020) provides on the clearest:

1. **Negative feedback signals** the absence of deviation, or the absence of any perceived mismatch, between the system's actual behavior and its targeted goal(s). In effect, the negative message of "no problem" is reported back to the systems central regulatory apparatus (servomechanism, computer, autonomic nervous system, brain, etc.,) signaling that no change in the system's output is necessary. Thus, negative feedback stabilizes the system, allowing it to remain steady or constant within its prevailing course of trajectory.
2. **Positive feedback signals** a mismatch between the system's actual behavior and its intended performance. Positive feedback messages initiate modifications in the system's operation, until the feedback is again negative and the system is on target. In fact, within highly complex systems, positive feedback can actually modify the goal(s), and hence the aim(s), of the overall system, itself.

Note that to integrate feedback, a system must have some centralizing (i.e., centralized) structure for self-correcting.

6.2.1 Positive-failure analysis feedback

Failure analysis is a powerful and essential tool. It can be conducted after the fact when a produce fails, and it can be conducted during the development of the product itself, to determine its functional parameters (in order to design a safer and more precise final system).

The procedure recommended by the Failure Analysis Society (ASM) International for conducting a fairlure analysis are as follows:

1. Collection of background data and selection of samples.
2. Preliminary examination of the failed part (visual examination and record keeping).
3. Non-destructive testing.
4. Mechanical testing (including hardness and toughness testing).
5. Selection, identification, preservation, and/or cleaning of specimens (and comparison with parts that have not failed).
6. Macroscopic examination and analysis and photographic documentation (fracture surfaces, secondary cracks, and other surface phenomena).
7. Microscopic examination and analysis (optical and electron).
8. Selection and preparation of metallographic sections.
9. Examination and analysis of metallographic specimens.
10. Determination of failure mechanism.
11. Chemical analysis (bulk, local, surface deposits, residues, coatings).
12. Analysis of fracture mechanics.
13. Testing under simulated service conditions (to reproduce failure).
14. Analysis of all evidence, formulation of conclusions, and writing of report (including recommendations).

6.2.2 Negative-punishment as feedback

The punishment, per say, is that if someone submits a solution to the system that is not sustainable and does not meet the conditions of the decision system (i.e., if someone's solution doesn't conform to the standard for safety and fulfillment), then the system cannot activate it. In other words, if a solution doesn't meet a set of base expected conditions, then the decision system, and protocols therein, will not let someone execute that solution in the system.

6.3 Neutral evaluation of material product as feedback

In concern to material production, there is the evaluation of whether the final material product is produced to form, fit, and function (FFF, F3); which refers to a design's physical shape, functional operation, and performance characteristics that uniquely identify a part, component, structural element, device, mechanism, or sub-system or sub-assembly:

1. **Form (object shape)** - refers to the way an object looks and is defined by its shape, size, and dimensions, including its geometry. It also includes the object's mass or weight. Usually, color is not considered a part of form unless it serves a specific purpose, like red indicating a warning or earth-toned patterns being used for camouflage.
   A. Does it meet shape expectations (and color)?
2. **Fit (contact precision)** - refers to how well one part, component, or element physically connects or becomes a part of another within a mechanism, product, structure, or system. It takes into account how details relate to the overall assembly, considering dimensions, tolerances, and surface finishes at interfaces.
   A. Do the shapes fit together into the assembly precisely?
3. **Function (use effectiveness)** - refers to the specific actions that an item or detail is designed to perform. Often, an item exists primarily to fulfill its intended function, such as a pump moving fluids, a valve controlling fluid flow, or a fastener locking multiple parts together.
   A. Does the assembly meet "your" need (issue resolution)?

6.4 Feedback loops

Feedback loops are the building blocks of system dynamics. A feedback loop is a structure within which a decision variable (flow) controls an action that is integrated into the system to generate a system state. Information pertaining to the state is then fed back to the decision variable, which in turn is used to control the flows. Two kinds of feedback loops comprise all complex behaviors of a system:

1. **Positive feedback loop** - a self-reinforcing loop that tends to amplify whatever is happening in the system.
2. **Negative feedback loop** - a self-correcting loop that tends to counteract and oppose changes. An increase in one parameter causes the other parameter to increase, which then decreases the first parameter.

A feedback loop is composed of two kinds of variables:

1. **State** - an accumulation characteristic of the state of the system that generates the information upon which decisions and actions are based. A state variable is altered by inflows and outflows and is represented by a rectangle in a model.
2. **Flow** - a variable that changes a state over a period of time. Flow variables are of two types: An inflow increases a state and an outflow depletes a state. In short, a flow is a statement of system policies that determines how information about the system is translated into action(s).

Cycles define process loops. A system is said to have undergone a cycle if it returns to its (or, an) initial state at the end of a process. The process of returning to an initial state is often called a 'loop'.

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TABLES

Table 5. Issue Urgency Recognition: *Decision urgency/priority spectrum (in brief). This is a multi-layered view that includes associated operational processes.*

Urgency Spectrum					
Weighting	Category	Descriptive criteria	Predominant approach	Operational process	Urgency states
1	Emergency	Life, immediate health, safety and the operation of critical systems	Reactive (protocol-driven)	Incident Response	High Urgency
2	Critical	Continuous operation of core functions at risk			
3	Recovery	A return to normal operating conditions			
4	Routine	Regularly followed tasks; the repetitive and cyclical effort to sustain or apply an improved design to the operation of systems	Preventative & Predictive (procedures and protocols involving a planned schedule)	Maintenance and Operation	Moderate Urgency
5	Strategic Preservation Planning	The procedural process of integrating new information from the Real World Community Model into the future design of systems	Strategic Integration (procedure-driven)	Strategic Preservation Planning	Low Urgency
6	Discretionary	All other economic issues	Inquiry-driven	Common decision space	No Urgency
0	Deferred	Review issue only when resources are available	On demand	No process assignment	

TABLES

Table 6. Issue Urgency Recognition: *Decision urgency/priority spectrum (in full). his is a multi-layered view that includes associated operational processes.*

<table>
<tr><th colspan="6">Urgency Prioritization Matrix</th></tr>
<tr><th>Weighting</th><th>Operational Process & Systems</th><th>Urgency Assignment Category</th><th>Continuous / On Demand</th><th>Characteristics And Criteria</th><th>The Process</th></tr>
<tr><td>1</td><td>Incident Response</td><td>Emergency Response</td><td>On demand</td><td>The issue's resolution necessitates the immediate activation of emergency services and those services assume priority allocation of resources - the emergency issue becomes the priority. Either (1) human life and community safety is at risk, or (2) the core support systems of the community are not operational or severely impacted with no presently available solution. Priority occupation of resources resolves to the system(s) or trained individuals that are required to resolve the emergency by following their evidence driven protocols and interdisciplinary team's procedural design solutions [in cases where problems require innovative solutions]. These individuals and/or systems represent the initial response to a disruptive incident. Emergencies usually involve the urgent life support needs of human beings and involve multiple habitat systems.</td><td>(1) The process of reducing and removing risk to human life;
(2) The initial response to non-operational core support systems</td></tr>
<tr><td rowspan="8">2</td><td rowspan="8">Incident Response</td><td rowspan="8">Critical Continuity Response</td><td rowspan="8">On demand</td><td>The core life or technology support systems of the community are in the process of failing [if no action is taken the system(s) will fail]. Processes, controls and resources are made available to ensure that the organization continues to meet its critical functional/ operational objectives. All critical issues threaten the near-term stability of a system. Critical issues have a time interval within which some action is needed to occur for the system to remain functioning.</td><td rowspan="8">(1) The process of taking action to prevent the failure of a system;</td></tr>
<tr><td>HIGH LEVEL CRITICALITY:</td></tr>
<tr><td>(1) Immediate restoration is required</td></tr>
<tr><td>(2) Maximum outage/downtime is between # and # hrs/ mins/sec before impact to human life occurs.</td></tr>
<tr><td>MEDIUM LEVEL CRITICALITY:</td></tr>
<tr><td>(1) Function can continue in default mode or not performed for 5 days. Immediate restoration not required. Failure to perform action will eventually impact performance of high level functions, but will not result in impact to human life.</td></tr>
<tr><td>LOW LEVEL CRITICALITY:</td></tr>
<tr><td>(1) Function can continue in default mode or not performed for 15+days. Function can be delayed until operating environment has been restored to normal.</td></tr>
<tr><td>3</td><td>Incident Response</td><td>Recovery Response</td><td>On demand</td><td>After a system fails it must be recovered before normal operation of the system is attained. Recoveries are planned for by the process of disaster recovery and system continuity planning. Planning is a priority issue and not an incident response issue.</td><td>(1) The process of recovering from a disruption;</td></tr>
<tr><td>4</td><td>Incident Response Subsystem</td><td>Priority</td><td>Continuous "inner loop"</td><td>The incident subsystem is a permanent part of the Habitat's architecture and requires continuous resource dedication. The incident subsystem handles the incident cycle – preparedness, response, recovery, and mitigation. The three response states of the incident subsystem are all protocol driven: emergency response; critical continuity response; and recovery response.</td><td>(1) Continuously monitor technological systems for signs of an incident;
(2) The processes of predicting and responding to incidents.</td></tr>
</table>

Urgency Prioritization Matrix					
Weighting	**Operational Process & Systems**	**Urgency Assignment Category**	**Continuous / On Demand**	**Characteristics And Criteria**	**The Process**
4	Maintenance and Operation Subsystem	Routine	Continuous "inner loop"	Involves all scheduled activities that preserve, improve, or adapt [to external conditions] the functioning a system(s), including modifications, updates, corrections, replacements and additions. Maintenance is a technical and procedurally driven process. Maintenance includes upkeep (and preservation activities) as well as installation issues, and requires an ongoing dedication of resources. If a system is not maintained then it will "fall over" and stop functioning, or its functioning will be detrimentally altered. The need for maintenance is predicated on actual or impending failure – generally, maintenance is performed to keep equipment and systems running efficiently for the usable life of the component(s). Ideally, maintenance would be an autonomous or unnecessary process. Maintenance is an ongoing exercise, a permanent part of the habitat's infrastructure and requires the continuous dedication of resources. A technologically advanced society will inevitably end up with an automation service infrastructure as technology resources reduce the need for human labor. The maintenance and operation subsystem represents a variety of degrees of effort.	(1) The continuous process of preserving systems to maintain their ongoing operation; (2) The process of modifying or replacing a system to improve or adapt its operation.
5	Strategic Preservation and Planning Subsystem	Priority	Continuous "inner loop"	The plan for the future state of the Habitat's systems, which follows a particular set of preservation strategies. The value system represents the desired effect that newly deployed systems will have on the individual and community. Plans are designed to achieve alignment with the community's value system. Remember that values are outcome orientations. Coordinating a Comprehensive Strategic Plan - A comprehensive strategic plan for the coordination of projects and integration of new designs, solutions, and needs. Functional Strategic Plan - a functional strategic plan is a strategic planning process for major support functions/sub-systems/programs/services/products.	(1) The "change management" process by which we direct our adaptation to new states of the environment (the real world community);
6	Economic Inquiry System	Discretionary	On demand	Prioritized as first come / first served. This category represents social and recreational needs, generally as part of the facilities system.	The process of arriving at decisions via a formally agreed upon and collectively informed method.
0	Deferment	Deferred	On demand	Review issue only when resources allow	Review

TABLES

Table 7. Operational Issue Processing: *The coordinated focusing of relationships throughout the decision system.*

FOCUS OF RELATIONSHIP									
Relationships	Constraints	Capacity	Work	Ability	Inquiry	Strategy	Protocol	Efficiencies	Architecture
Conceptual	Boundary	Structure	Requirement	Capability	Solution	Solution orientation	Design optimization	Design efficiency	Design services
Environmental	The habitat	Strategic preservation	Strategic planning	Viable/ -ility	Environmental inquiry & Resource inquiry	De-/composition control strategy	Recyclability / Adaptability	Recycling efficiency	Information model (Environmental restoration service)
Technical	The habitat service systems	Strategic efficiency	Operations and maintenance	Feasible/-ility	Technically economic inquiry	De-/integration strategy (I.E., Production control strategy)	Interoperable / Durability	Production efficiency	Service systems (Constructions)
Social	The community operational processes	Strategic safety	Incident response	Desirable/-ility	Justice inquiry & Preference inquiry	Distribution control strategy	Updatability / Automatability (labor)	Distribution efficiency	Operational processes (Our emergent task behaviors)

Solution Inquiry Accounting

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Keywords: engineering specification, product specification, design and construction specification, solution design inquiry, solution accounting, solution inquiry, solution unit accounting, solution unit survey, solution unit analysis, formal specification, formal master-plan, master plan, master-planning, strategic plan, blueprint, proposal, economic [habitat] decision planning, executive project, needed solution,

Abstract

The solution is the concept to be built, the structure that solves the issue or results in an environment that does not produce the issue to begin with. A design is only a concept until it is built (and becomes a reality, exists and has location, in the real-world). The base unit of economic production in community, in general, is the 'habitat', which may then be networked regionally and globally, providing a network of distributed, but also localized, personal and common [habitat] access locations where services and objects are freely accessible. If an economy is the acquisition and transformation of resources into needed goods and services, then it relies on the efficient allocation and utilization of those resources to meet the human [need] demands and personal preferences of individuals among society. To produce per human requirements, itself requires various economic activities, the primary activity sets being: production, distribution, consumption, and cyclation (a.k.a., recycling). The goal of all solutions is to optimize resource allocation, maximize productivity, and ensure the provision of essential goods and services to sustain and enhance the well-being of all individuals and the overall functioning of human and ecological life. Thus, a solution may refer to an economic plan at each real-world level of the economy: 1) the global habitat service system; 2) the regional habitat service system; 3) the local habitat service system; and 4) the individual (and their family). Solution inquiry is the ultimate synthesis that puts together and houses the solution, prior to its operational execution as a change to community production (i.e., to fixed production, heavy production, and/or light production). Every solution is, in effect, a plan [of action], and all plans are lists of actions to be performed. Solution inquiry must engineer the development of an acceptable plan given the separate secondary (i.e., not "solution or effectiveness inquiries") parallel inquiry processes.

Graphical Abstract

Image Not Yet
Associated

1 Solution accounting and inquiry

A.k.a., The engineering view, the solution view, the executive project view, the plan-of-action view, the actual design specification view.

Solution inquiry (a.k.a., engineering inquiry) serves the purpose of engineering, examining, and exploring potential socio-technically mechanistic solutions to a given problem (or, issues). A solution is a synthesis; a synthesis of ideas, resources, and strategies designed to address a specific problem or achieve a particular objective. The solution inquiry process makes a proposed solution explicit through systems-science design-engineering. All solutions are proposals to the resolution of issued problem, about need. The solution inquiry process exists to design and otherwise engineer selectively adaptive solutions to needs and issues that have opened a ‘decision space’ in the common decision system. The solution inquiry process may be otherwise known as “the engineering problem”. Essentially, this inquiry process applies systems design principles and engineering techniques toward the re-solving of technical problems embedded within a context of human need and individual fulfillment in a unified and integrated habitat service system, a “material[ized] community”. The solution inquiry process could also be considered a technical inquiry process: as a system of “awareness”, the solution inquiry process formalizes the proposed technical design-solution for an issue and accepts technical “acceptability” feedback (as an input) from the other common inquiry process, which it uses to adjust its formal design [specifications]. Through the conception of a ‘design-solution’ humans extend their consciousness into the world and make the world different.

CLARIFICATION: *The final habitat (local and regional network) master-planned solution-specification is sometimes known as the "executive project", because it is the project file that is given over to the construction and habitat operations teams for execution upon.*

Importantly, there is rarely a solution that is universal. Rather, the ‘correct’ [cyclical master-plan] solution is likely one that is (1) locally appropriate, and (2) responsive to the global situation at hand:

1. Local habitat residential customization.
    A. Cyclical multi-year decided re-master planning of the local habitat by its residents.
2. Global habitat resources, designs, and operational services.
    A. Global human need and preference (demands).

At a fundamental level, the solution inquiry process asks, What is the optimal engineering specification (master plan) that could be constructed for a local habitat (and/or regional network of habitats), given access to a decision system with a parallel ("balancing completion") inquiry resolution process:

1. The socio-technical master-plan engineering inquiry process (*a decision project sub-working group*).
2. Feedback inquiry (*a decision project sub-working group*).
3. Need and preference inquiry (*a decision project sub-working group*).
4. Access inquiry (*a decision project sub-working group*).
5. Technology inquiry (*a decision project sub-working group*).
6. Resource inquiry (*a decision project sub-working group*).
7. Economic calculation inquiry (*a decision project sub-working group*).
8. Environmental inquiry (*a decision project sub-working group*).

In the context of solution inquiry, every issue is a need. A need [issue] inquiry becomes a request for the creation of a solution to resolve the need [issue]. All needs form requests for resources in a material system. It is possible to coordinate a contributed set of resources to the construction and operation of a global habitat service-object access platform composed (habitat service system) of many local, thereupon regional and global, habitats. It is possible to plan these habitats locally with global coordination, through coordinated access to common-heritage global-habitat resources. There is a continuum of formal solutions to issues (fulfillment for need) from that of the social to the technical. Social processes can be optimized to meet human needs, and material objects can be configured to more optimally meet human need. The "local" configuration of a solution is a habitat [service system] master plan, which uses resources placed into technological configurations to be constructed and operated in the real-world.

A system could be considered the solution to a problem. Problems are solved, and the answers to problems are solutions, which are systems. Systems are holistic by nature, and solutions are the holistic result of integrating everything available into a synthesized and directional) information set. Simplistically, a solution is to provide a proposal, an answer, for achieving desired goals. In an engineering solution, the desired goals sub-compose into requirements, which involve sub-problems (often logical and mathematical), and inevitably, materialized solutions that are operative in society that resolve exact[ly defined and projected] problems, which may be real or imagined. A solution is a probable or final synthesis. For example, the simulation of the habitat service system is a synthesis, and the construction of a societal system model is a synthesis.

“A problem well stated is a problem half-solved.“
- Charles Kettering

A solution is a resolution to some issue or event. A solution arises from a need [on the part of consciousness]. A source of need (i.e., consciousness) has the possibility for taking an active role in completing its need by determining the problem(s) the need presents, resolving solutions, and then executing the one solution that most optimally completes the need. In other words, solutions resolve the needs of conscious entities. Sometimes, those solutions are called 'answers' (in math and logic), in engineering they are most often called 'models', 'specifications', and 'operations', and in project coordination they are most often called 'proposals' and 'plans'.

A problem is the cause of a solution. A solution is that which can be logically evaluated to solve (-pre) or have solved (-post) a problem. Society is an organization with a requirement for a common problem solving methodology in order to resolve a commonly optimal societal solution. Socially organized populations have a necessity for problem-solving (or otherwise, course correcting), which results in the execution upon information to change the state of materialization for the benefit of the whole social population.

To resolve a problem set into a solution set, a problem is broken into discrete parts. Those discrete parts are sub-problems. Sub-problems may be solvable concurrently with the help of parallel processing. Each sub-problem may be further broken down into a series of instructions, so that the an information processor can access and resolve each one. In a parallel processing situation, instructions from each part execute simultaneously on different processing units. In quantum ("astral") processing, instructions execute more immediately in time.

APHORISM: *Socio-economic problem-solving requires societal [re-]design.*

The solution inquiry process is a participative design process. In other words, we design the community participatively. Together, we build up the best idea (i.e., the true market of ideas). It is here that we share our solutions and formally collaborate toward selectively designing newly meaningful structures with a higher [formalized] potential of fulfillment. In a sense, every issue is an inquiry into the community for fulfilling solutions.

The output (or "product resource") of the *Solution Inquiry* process is a series of technically calculated as feasible, desirable, and viable [micro-calculated] design specifications for the next iterative structural design of the total habitat service system, which includes the designed re-allocation of all known resources. These systems-based, engineered solutions might also be known as 'technical system design specifications', or 'technical engineering solutions', and they are the selective output of this inquiry process.

It is important to note here the logical and linguistic forms of every solution:

1. What logical languages does the system's design require?
2. What is the temporal (concept) and spatial (object) logic of the system?
   A. Spatial logic is discrete logic presented with objects.
   B. Temporal logic is probability logic presented with concepts. In logic, 'temporal logic' is any system of rules and symbolism for representing, and reasoning about, propositions qualified in terms of time (vs. space). Through 'temporal logic' we can then express statements like "I am always hungry", "I have hunger", "I will eventually be hungry", or "I will be hungry until I eat something"; we can express frequency. 'Temporal logic' has found an important application in formal verification, where it is used to state requirements of hardware or software systems over time. For instance, one may wish to say that whenever a request is made, access to a resource is eventually granted, but it is never granted to two requesters simultaneously. Such a statement can conveniently be expressed via temporal logic. 'Temporal logics' is a formal language for specifying and reasoning about how the behavior of a system changes over time; and, it is a design element in every adaptive system. And, it usefully allows for the scheduled use of a system. Temporal logic isn't necessarily immediately visible. For example, spanking "your" child may give a parent immediate behavioral results, but s/he isn't likely to notice the cause and effect relationship between spanking and the manifestation of other issues in the future, such as the higher probability of a lower IQ, more "acting out", and violence toward others outside of the home.

These specifications are then enacted upon by the participative community, including interdisciplinary teams and modular (/reprogrammable/reconfigurable) habitat service systems.

Specification
(noun)
1. An act of describing or identifying something precisely or of stating a precise requirement.
2. A detailed description of the design and materials and other resources used to make something.

The term **specification** may be sub-divided by the terms *requirement* and *design*. In general usage, a 'requirement' is an order, or demand, or imperative, and a 'design' is an intentionally planned-out systematic structure with at least one usage function.

1. A **requirement** could also represent a straightforward intention in the fulfillment of a need, or a technical objective. In an engineering context, requirements exist for the design of anything which is to be engineered. A *systems requirement*, for example, is a characteristic of a system that any system solution is required to possess. When a requirement has been identified with language, it becomes a *specified requirement*. Here, the term *design requirement* might also be used. When a set of specified requirements on a system is brought together, then we call this the *requirements specification** for that system (Read: a 'system requirements specification').
2. A **design (solution visualization)** refers to a description and/or explanation of the solution to a problem or motive issue with a set of causative variables in a determinable probability space. A design is, in part, the functionally required operation for a solution. When a specific record is made of a design, this is known as a *design specification** (or *blueprint*), which is itself a functional information model. A design specification identifies how the design does what it does and what resources it needs to do what it does. Here, design can occur throughout the spectrum of freedom that is a community. Some design specifications are written in a more discursive manner, like the one you are reading right now. 'Designs' are sub-composed of *tasks* that must be completed and *resources* that must be available to construct the whole system's design. 'Requirements' generate the space for conceptual through to material design. Technical [information] designs are representative of information that may be both conceptually related and also must be capable of being technically constructed and tested in the material world, which feeds back information to us about all designs. A design for anything in the real-world visualizes:
    A. The occupation (allocation) of resources into some assembled service.
        1. A visualization of every object is present.
        2. A visualization of the object in its assembly is present.
    B. The flow of materials through the local habitat and global habitat (e.g., material flow diagram).
        1. A network visualization is present showing recorded changes in location (i.e., geo-positional changes) and/or conception (i.e., changes in movement; slow to fast, up to down, vehicle to carry, electrical, etc.).

In some industry sectors, such as medical, defence, and aerospace the word "specification" is normally used to mean 'requirements specification' (see first bullet above). In other industry sectors, for example, in the construction industry, the word "specification" is normally used to mean 'design specification' (see second bullet above). To avoid confusion and error, it is best to be explicit – that is, to refer to 'requirements specification' or 'design specification' as applicable, both of which are involved in every solution to every issue that passes through this inquiry space.

There are three phases to every solution, each with their own specifications, which are often given different names:

1. **The design phase** (of the solution) - delivers the visuals, the design, construction and operation specifications. Here the solution is visualized in its entirety. The design phase produces a specification for the master plan of information (a.k.a., standards) and the master plan of habitats (the construction and operations specifications). What is required in this phase is a master plan for coordinating the development of [information] standards, and a master plan for coordinating the operation of [material] habitats. In concern to local habitat customization, the design produces an urban (preference and aesthetics) service plan. Designers follow manuals and procedures, and also design manuals and procedures that describe and explain the construction and operation of socio-technical systems.
    A. The global design plan to account for all common heritage resources and the fulfillment of all human need, sustainably (a.k.a., the economic plan, the global calculation plan, etc.).
    B. The local design plan to account for resident preferences for service and aesthetics (a.k.a., the master-plan, the urban service plan, the habitat service system plan, the habitat design and operations plan, etc.).
2. **The construction phase** (of the solution) - constructs, fabricates, builds, and assembles the solution. Here, the design in its visual entirety is followed in order to produce an expected/intended outcome and future service/outcome). The construction phase is also known as the "means of production". Some of what is constructed is then operated directly for human need fulfillment, like architecture and someone's personal dwelling. The dwelling is constructed and then the user occupies it. However, there are also constructions (Read: "means of production") that contributors (laborers) operate in order to produce final end-

user products that then circulate through the habitat as personal and common access locations and items. The construction phase follows the design phase's construction/assembly specification in the construction of the habitat to master plan/specification. What is required in this phase is the following of a construction-type master plan for coordinating the construction of standards and habitats. Constructors follow manuals, procedures, and construction specifications to construct operational services.
3. **The operation phase** (of the solution) - operates the constructed solution. The operation phase follows the manual (handbook standard) of procedures from the design phase to coordinate working groups (to develop standards) and operate habitat services as members of contributing habitat service teams. Operators follow manuals and procedures to operate information and habitat services.

In community, individuals seek designs that harmonize their well-being with the well-being of others and of the planetary ecology, as a **design requirement**. Design cannot just involve the people or the planet; such a dualistic notion of well-being will not lead to well-being. Instead, designs must recognize the scaling of need fulfillment from the individual, to the social and the larger ecology.

What type of production is the solution to the issue:

1. A specification.
2. A means of production.
3. A whole habitat.
4. A whole habitat network.
5. A continuous (appropriately homogeneous output; e.g., electricity and clean water).
6. A hetergeneous output (socio-technical assemblies such as food, medical, toys, machines, etc).

Electricity differs from many habitat sectors (industries) in that it produces what a continuous homogeneous output – all users/customers receive the same product; although, not in the same quantities. The supply of fresh water is similar. Other services might produce a limited range of standard outputs. Most services produce a wide variety of products of different sizes, styles, and qualities. In the case of these habitat services and the production units that make them up, the level of stocks of each product, and the sizes, qualities, and styles in which it is available, needs to be monitored and production adjusted in real-time where appropriate to match demand.

The *Solution Inquiry* asks [in part] the following questions:

1. What is the design / engineering problem?
2. What is required of the issue and of the solution?
3. What is technically possible?
4. What can we do with the resources that we have?
5. What designs are previously available?
6. What newly created designs are becoming available?
7. How does the solution technically align with our chosen value orientation?
8. What orientational re-composition is this design actually structuring into our service fulfillment systems?
9. How does the solution technically integrate into the pre-existing habitat and socio-technical structure?
10. What does the solution do and what kind of problems does it solve?
11. What difficulties are likely to appear from a particular solution's integration.
12. What are the technically feasible solutions: how are they composed; why are they composed; what is the validity, desirability, and feasibility of their composition? What are the solutions total orientational abilities?
13. What further information do we need to solve this problem?

This inquiry process involves the very basic steps of a solution-orientation:

1. **Acknowledge** the issued requirement-problem, the need.
2. **Collect available data** on the issued requirement-problem.
3. **Study** what causes the problem. Investigate the current information and design landscape, and its relationship(s) to the problem.
4. **Apply** some degree of analysis-synthesis while acquiring more information as needed.
5. **Construct** a potential solution(s) with the information available.
6. **Run** the solution through a common and parallel threshold inquiry system to determine its total 'solution potential' (i.e., its ability to be certain of completion of required outcomes, need completion).
7. **Test** solution and acquire feedback, where appropriate.
8. **Construct** and **operate** the solution to the requirement-problem.
9. And, if the problem wasn't solved, then repeat the process until it is solved (i.e., it is iterative and adaptive).

Iterative design is the repetition of a process or system with gradual changes, improvements, and optimizations. Solution inquiry is a dynamically adaptive process, and hence, its repetition (iteration) evolves the total information space, which makes future issues easier to resolve. Remember, this is a systems approach. Here is an eternal truth about projects: you always see, understand, and learn more about what you're trying to accomplish as you go along. Often these new learnings result in important new ideas about how the project should turn out. Our designs will evolve as we learn more.

Among the most important questions to ask about a solution itself, include:

1. What is the solution?
2. What abilities are required for the solution to exist?
3. What resources are required for the solution's implementation, and are those resources available or accessible?
4. When must, and when will, the solution come into being?
5. Why is the selected solution better than the alternatives?

The Solution Inquiry process necessitates functional design. Herein, 'design' is a creative activity that translates a 'requirements specification' at the functional level into a set of attribute values of concrete things that function together as a whole systems 'design specification'.

It is possible to have an open-source and transparent solution to human habitation together on this finite planet, where humanity can now design habitat access systems, and create a common heritage network through which resources flow to optimize the fulfillment of everyone. Hence, the solution consists of flexibility, but is also deterministic:

1. **Flexible to meet local preferences for fulfillment** - human regional and local habitat resident agreements.
   A. Access - to habitats through agreement.
      1. Technology - all usable items:
         i. High-to-low customizability in time.
         ii. Planned fixed cycles.
            1. Planned essential global habitat service sectors (life, technology, exploratory).
            2. Master aesthetic and service multi-year re-plan service [agreements] (habitat decision working groups).
2. **Determined to meet human needs** - human and ecological services.
   A. Access - to habitats with services and usable objects.
      1. Technology - all usable items:
         i. Tool - technology used to produce another technology.
         ii. Good (a.k.a., final user product, assembly, habitat, etc.).
   B. Technologies acquire (access) resources from the ecology:
      1. Mineral.
      2. Biological
      3. Social contribution (socio-technical).

The Solution Inquiry process is partially a systems engineering process, which involves the application of a systems engineering methodology. Engineers ask questions. They are not led by opinion. Engineers seek functional aesthetics, not an audience. Engineers select tools based upon their most current, and emergent, understanding of the total problem space. The term **systems engineering methodology** is defined as the selection of systems-based methods for the engineering of technical solutions.

Systems engineering is an interdisciplinary field of engineering focusing on how complex engineering projects should be designed, integrated, operated, and modified over their life cycles. It is a holistic and interdisciplinary approach to arriving at creative designs under the conditions of systems dynamics and knowledge complexity. The term 'creative' is defined herein as the unique arrangement of known variables so as to optimize the functional orientation of the resolved system toward one of greatest fulfillment. Systems engineering involves the processes of solution analysis, design synthesis, knowledge discovery, technology development, service integration implementation, and system de-cycling.

Whole-systems engineering involves the optimization of an entire system for multiple benefits, not isolated components for single benefits. As a result, more efficient systems maintain fewer costs by integrating helpful interactions between components. Efficient design is about more than designing clever, highly efficient components. In nature, individual species and organisms create a lot of waste, and hence might be considered inefficient. But integrated ecosystems are highly efficient because outputs of some components are inputs to others, reducing total net waste to zero (each organism's wastes are another's food). Applying [analogous] systems integration in an 'engineering design space' allows for the application of highly efficient solutions. An important engineering question is, "Is the waste (or pollution) necessary given what we know?"

When a community compares all of its possible technical variables and conceptual strategies against the criteria of cost, performance, and environmental and social impact (fufillment and damage), then it has a relational information system on its hands, which may be used to facilitate the arrival at intelligent design decisions (i.e., solution specifications) about best (or optimal) solutions.

Please do not impulsively dismiss the involvement of systems engineering or the somewhat technical description of this inquiry process. If the reader does not have an engineering background, then it would still be wise to recognize that what is described here is the methodology by which humans have developed the vast majority of their modern technologies. In academic schooling, an education in systems engineering is often seen as an extension to regular engineering courses, reflecting the "attitude" that engineering students need a foundational background in one of the traditional engineering disciplines (e.g. mechanical engineering, industrial engineering, computer engineering, electrical engineering) plus practical, real-world experience in order to be effective as systems engineers.

Systems engineering requires not only analysis, but synthesis. Typically, systems engineering is offered at the graduate level in combination with interdisciplinary study. Undergraduate university programs in systems engineering are rare, which speaks to several points. First, systems engineering isn't considered sufficiently valuable to the current, modern economic system to teach to everyone. And second, that it is a topic that requires a large degree of subject matter expertise between the systems under investigation. Essentially, it requires a particular thinking process, which is not taught at a common level in schooling.

Systems engineering requires a thinking process that can account for and adapt to the recognition of patterns within a dynamically iterative environment. It is important to note here that there are structures in society that reduce our ability to synthesize patterns from information (i.e., to think systematically). In early 21st century society, two common structures that reduce systematic thinking are: extrinsic motivation and schooling, which may be otherwise known as "thinking strictures".

Systems engineering has allowed for the development of complex modern technologies, such as smart phones (and their accompanying infrastructure), mass rapid transport systems, and robust data processing technology. This decisioning systems model uses systems engineering for redesigning the integrated fulfillment systems of the community's habitat. Systems engineering can be used to build a small home or it can build an entire community; it can be used to build a phone or a weapon.

Systems engineering is, in many ways, a fractal and evolving process through which ever more knowledge is acquired and technology designed in the generation of a more [technologically] thought responsive environment.

The *Solution Inquiry* process is purely technical, devoid of any human opinion or bias (and, if such bias does appear, the process itself is designed to make it visible, accountable, and acknowledge. A structure cannot safely or efficiently be built on the basis of opinion, secrecy, or the chaotic mixing of agendas. Engineering is not the science of opinions. Material architectural structures are not comprehensible through opinion. Holding an opinion is like stopping at a rest stop and not the destination. It is like building a partial system and then claiming that the rest of the system is superfluous. Biases, cognitive and otherwise, have no place in the design of engineering solutions. And, their accidental integration is highly likely to cause safety-instability issues in real world system; which, by the way, become equivalent to "programs" that just run continuously in the background of our lives.

Opinion has no place in engineering design where optimization of function occurs as more coherent information becomes available [to an intentional task constructor].

Systems engineers understand to a great degree that there is no best anything; there is only the best up until now. With advances in our knowledge and creative abilities our systems may be designed to respond and adapt to our needs and our situations in a more freeing and fulfilling manner. A community can only design the best production service that it knows of up until this moment in time. There are no utopias, no final frontiers.

Essentially, the *Solution Inquiry* process is a space of refined cooperation and participation in synthesizing, testing, and integrating new designs.

> **NOTE:** *When one component is removed from a complete system, suddenly an engineer cannot trust the whole system.*

In the context of development,

1. A proposal or plan is a form of a solution.
2. A solution is a model (or specification) that can be executed, or model (or specification) that is being executed. There may be a set of solution models from which to select one to execute. The next solution is another model (i.e., post execution of the initial solution, the next solution is another model).
3. An operational system is the ongoing execution of a solution.

The concept of a 'solution' could be sub-classified in the following ways (i.e., a solution is):

1. A documented (specific) way of satisfying (fulfilling) a need (requirement) in a context (environment).
   A. Documented in memory.
2. A solution is sub-composed of [conceptual and/or physical] descriptions defining (and possibly, explaining) the solution.
   A. A commonly useful description (and explanation) of some thing.
3. That which is represented as the predicted state to resolve an issue, or other problem.
   A. A prediction, proposal or plan for doing.
4. An appropriate, correct, or just (as in, justice) selected answer (i.e., response) to a problem or decision space (i.e., "gap"). Note that a decision space may have more than one possible solution (wherein, all the solutions together, or just the selected solution, describe a solution space).
   A. A correct selection.

5. A solutions is a set of changes to the current state of an organization that are taken as actions to enable the organization to meet or better meet a requirement, solve a problem, or take advantage of an opportunity, all of which mean the same thing.
   A. A set of changes.

> **CLARIFICATION:** *A 'change solution' is a specification for the controlled transformation of an organization into that solution. In this sense, solutions are change requests (or the changes themselves) to an environment.*

A 'design' (specification or model) is a usable representation of a solution. A design is a reference point for cooperation (common action). A specification is anything that describes (and/or explains) what an actual instance [of a solution] looks like. In this sense, a solution is (or becomes) an action that is described (and/or explained); it is something that represents a commonly understandable action with the potential to resolve a problem or decision.

> **NOTE:** *To get an accurate understanding of a problem or solution often requires several views with some type of formal description of the relationship between the views.*

More completely, any given solution is likely to hold at least one of the following characteristics, such that a solution is also:

1. A recognition of the problem, which opens a space for its resolution through a 'solution'. See the issue as a problem, inquire sufficiently to design the solution, now apply it, and evaluate. Recognition of cause and effect (cause and effect thinking) allows for the identification of gaps in inputs, processes, and outputs (i.e., problems).
2. A holistic, integrative approach to the persistence of an intentionally existent system, such as one that fulfills human life requirements, while satisfying a set of cooperative societal constraints.
3. Unifying systems of understanding and action; a unified approach to planning (deciding and coordinating) the total effort required to transform a set of imperatives into a solution. In other words, a unified approach is required to optimally plan, coordinate, and execute the total technical and informational effort required to transform a set of imperatives into a realized (materialized) solution.
4. An internal coherence (informational and material) grounded in reality or the real world versus a set of logic and internal coherence not grounded in 'life' and a recognition of its cycles.

More simply,

1. A solution is a [designed] response to a problem event. Where an event (E) + response (R) equates to an opportunity (O) for greater or lesser fulfillment in the world].
   A. E + R = O
   B. Wherein, the event exists in an environment. The response requires motion in the environment.

A solution is a desired result, an outcome. In order to produce an outcome, the following questions must be asked:

1. What is the outcome?
2. What is the mechanism to generate the outcome?
3. What are the resources available to generate the outcome?
4. What is the resourcefulness of those who are to generate the outcome?

The three common solution abstraction levels are:

1. **Conceptual level** - elaborated without any organizational or technical consideration. It is the steadiest (most permanent level, which leads to understanding of the purpose and activities of a [societal] system.
2. **Structure level** - integrates an organizational order; assignment of resources to activities through a parallel inquiry process.
3. **Realization level** - integrates technical requirements and social constraints in the selection and execution of a design specification.

Socially coordinated solutions must coordinate between several information sets, including:

1. **Performance focused** - objective improvement
2. **Design structured** - activities controlled through planning.
3. **Data based** - informed with useful information and knowledge.
4. **Reasoned - processed logically (logic are a universal** standard for reasoning). All rational actions require the prior foundation of logical absolutes.
5. **User-centered** - links a user to a problem and its possible solution(s).

> **NOTE:** *Critical to the success of any problem-solution coordination is involvement of users (of the solution, and other stakeholders) throughout the project engineering process.*

This is a project to develop an operate a societal-level solution system. In part, a mutually beneficial societal-level solution involves, at least:

1. The commonly sensible experience of designing, building, operating, and cycling information and materiality in order to solve for problems (gaps) in human fulfillment and ecological stability.
2. The individual human users of the societal service system, who has needs, and may or may not have an issue with the active service solution.
3. The individual human contributors who completing need(s) by resolving (through analysis and synthesis) a societal [systems] problem, providing a life-oriented population the likely possibility (opportunity) to flourish together (Read: to have all their real world needs met together).
4. An economic efficiency approach that ensures the optimal usage of resources.
5. A set of technologies that ensure the ensure the optimal usage of human time and energy.

For the continuation and optimization of "our" human lives, individual issues with need fulfillment are understood to have societal-level consequence, and therefore, societal-level relevance. "We" can regularly solve [all societal] problems by considering the whole of individuals among a [societal] population. Life (and living a desirable life direction) has requirements, for which solutions can be held to account for how greatly or poorly they align with a traceable life direction.

The societal solution proposed by this project could be thought of as a convergent design solution that is highly likely to mutually benefit all of humanity. A helpful analogy is how manufacturers of different phones or automobiles often end-up with similar looking products. Not because they have the same designer, but because their design fulfills a common need given the information and resources available. This is a project to design and implement an up-to-date society (Read: to create a completely up-to-date society given what is known and available).

> **INSIGHT:** *Society may be viewed as a system of solvable problems. In other words, society is a system of problems; or, society is a system of solutions. The problems that compose society may be re-solved together through cooperation and sharing. The problems that compose society may be resolved through other value orientations (e.g., competition and ownership), but those orientations are likely to produce undesirable psycho-social and ecological results. The solutions that compose [the complex of] society may be designed to orient individuals in any number of potential directions. The solutions that compose society ought to orient humanity toward flourishing and individual well-being.*

1.1 Solution optimization requirements

Solution optimization and selection involves [at least] the following requirements:

1. Acquire [all] standards.
2. Acquire sufficient data to resolve the decision to a solution selection [that meeds human needs] with high confidence; acquire:
   A. Human data.
      1. Demand data.
   B. Resource data.
      1. Available resources data.
      2. Current habitat configuration data.
   C. Technology data.
      1. Service, material, tools, skills, knowledge data.
   D. Planning data.
      1. Master habitat plan data.
      2. Master deciding plan data.
3. Acquire [all] possible solutions.
   A. Execute single possible master-plan solution for global norm and locally customized fulfillment.

2 A solution [production] cycle

A.k.a., What is a simplified solution life-cycle to any problem?

A solution [life-] cycle is the spiral flow of information between problems (issues) that need solutions (answers), and the complete resolution of those issues.

The product (deliverable) of this cycle of solution-producing work is a production master-plan solution, capable of being operationalized by habitat teams working on the material system and standards groups working on the information system.

The habitat has two basic categories of production that the global solution cycle must account for:

1. **Habitat production (habitat-human fulfillment):** Production of the fixed and quasi-flexible architectural-infrastructural habitat on some cyclically annual master planning basis, involving local configuration decisions with decisions about the global coordination of resources. This [habitat] production meets the human habitat service needs of those who will live in a local habitat. Here, the production cycle is the habitat, re-master-planned every 3-5 years.
   A. The product is the resolution of a life or exploratory need for service and service objects within a local life-radius.
2. **Technology production (technology-human fulfillment):** Production of useful technologies, including light and heavy production (note: heavy production is often done outside of the perimeter of an actual local habitat). Some of these productions are inflexible, in that they will produce a set amount and quality of deliverable output that cannot be easily changed (e.g., mining, harvesting, etc.); others are forms of production that allow the coordinator-technicians to flexibly change the per demand. Production usually runs in a, "production cycles"; here, the production cycle is some useful product (for team or user access). In some cases, it is possible for users to have preferences and for production to be re-configured during the current production cycle to meet actual user demand for one preference (customization) over another. For example, a machine that can flexibly switch between producing shirts of different colors. This production within a habitat meets the technology requirements, and preferences, of its global user base.
   A. The product is the resolution of a technology need for service and service objects within a local life-radius.

There are a variety of ways of visualizing the [need] solution cycle, including:

1. Need solution > plan solution > design solution > build solution > run solution > experience solution > need solution.
2. Need > concept development > product design > manufacturing > distribution (with feedback to product design) > support maintenance (with incident response) > upgrades > retirement & disposal (with regeneration cycles) > need.
3. Need > solution becoming current implementation > feedback on current implementation > need.

The prototypical solution resolution process is:

1. **Observe** an issue.
2. **Analyze** the problem.
3. **Design** possible 'solutions'.
4. **Select** a 'solution'.
5. **Materialize** the 'solution'.
6. **Use** the 'solution'.
7. Repeat the cycle.

A simplified solution design life-cylce is:

1. **Plan.**
2. **Do** (1st Act).
3. **Check.**
4. **Act** (to correct).

In technical systems, methods are used (applied) to solve problems. The most common method for resolving solutions that require action can described as the problem-action model, involving the stages of:

1. **Planning** - Actions are planned [in the form of documented 'procedures'].
2. **Designing** - Problems are solved [through design 'specifications]'.
3. **Building** - Designs are built into actual [datum] constructions [through humans, tools, techniques, and other inputs].
4. **Testing** - Constructions are evaluated [through feedback].

> **NOTE:** *In community, when feedback is integrated, the societal system is re-oriented to remain (or, to more greatly) align with the intentional and explicit direction for the society. Therein, InterSystem Teams develop the new solution and coordinated the restructuring of the environment.*

Most design or change processes have a cyclic, iterative process consisting of four steps or phases representation of a system's 'life', the life-cycle of any solution to any problem:

1. **Reflection** - value determination.
2. **Analysis** - objectives.
3. **Synthesis** - new solution.
4. **Experience** - properties of current/new situation.

> **NOTE:** *These phases can be recognized in many creation lifecycles that use similar phases, though they may use different names.*

More completely, the starting point for a design or problem solving process is based on:

1. **Discovery** that a system, issue, problem, opportunity or other contemplative situation exists.
2. **Reflection** regarding the current situation. This can also be described as a 'problem' or a (negative) value judgement regarding a specific, existing situation. Another starting point could be the identification of an 'opportunity', which can be considered as a (positive) value judgement of a potential future situation. The positive or negative value judgement is the result of a reflection regarding an existing situation. This phase could also be called the discovery phase, after which a decision has to be made regarding the current situation. If the value judgement regarding the existing situation turns out to be positive, no change is needed and the design process can stop. If the judgement turns out to be negative, change is needed and the design process can continue.
3. **Analysis** phase where the problem is interpreted and a new desired situation is envisioned and defined in an abstract manner. This is called the analysis phase, where it is determined what the requirements of a new situation would be, though the new situation is not yet concretized in the form of a specific solution idea or concept. These requirements can be considered as an abstract description of a new desired situation, while not describing the concrete details of this new situation.
4. **Synthesis** phase, focussing on concrete idea generation and development. During this step, new creative directions are being explored, resulting in a description of a new possible solution. This phase is often considered as the 'real' design phase, as new concepts and solutions are being generated, created, described and visualized. In product design, this is often done by means of drawing and sketching. In product-service design various other tools are available like the creation of solution maps, future scenario's and storyboards \
5. **The new concept or solution is simulated or realized** in real life, a new situation with new characteristics can be experienced. This experience phase could be based on a model, a prototype, a simulation or on the final product or solution. Based on this, an evaluation can be made that can form the basis of a judgement regarding the value of the new solution, which brings us back to the reflection phase (1) again. If the value judgement turns out to be positive, the design is finished and the process stops. If it is unsatisfactory, a new design loop could be started again. Together this creates the cyclic iterative process as visualized.

2.1 Solution [cycle] integrity

Within a solution cycle, information must maintain integrity if it is to be useful when the cycle repeats (i.e., usefulness requires memory). Information integrity has [at least] two complementary components:

1. **Validity** - that which "guarantees" (with some degree of certainty) that all false information is excluded from the information system.
2. **Completeness** - that which "guarantees" (with some degree of certainty) that all true information is included in the information system.

In the operations domain, system integrity means that the system must work [as expected], and must be tested to ensure that it keeps working [as expected]. For example, in an operating societal information system, optimally, the system must have some method to exclude false information [to ensure validity] and include true information [to ensure completeness].

> **INSIGHT:** *Everything meaningful is figure-out-able through a cooperative structure. The harmony of life together can be optimized through a figured out plan, a solution system.*

2.2 Socio-technical habitat service design

Habitat services provide for the fulfillment of humankind's socio-technical needs. A habitat service system's operational design designators are:

1. Concept type:
    A. Service designator (a.k.a., discipline designator, support service, social unit designator).
        1. Standards documentation.
2. Object type:
    A. Position in existence and located coordinates.
        1. Habitat location and region.
3. Means of production (i.e., socio-technical object designation):
    A. Service (i.e., discipline designator, social unit designator).

1. Need process type identifier (i.e., life, technology, exploratory).
   i. Sub-process identifiers (e.g., A, B, etc.).
2. Operational process-type Identifier (i.e., planning, operating, emergency.
   i. Sub-process identifiers (e.g., A, B, etc.).

B. Object (i.e., technical unit designator).
1. Object unit-type identifier (e.g., sheet sub-content, ...).
   i. Sub-unit identifiers (e.g., A, B, etc.).

4. Specification of production (i.e., technical designs).
   A. Sheet type (a.k.a., type of design/simulation specification).
      1. Sheet/simulation sub-type/context (e.g., sheet sub-content, ...).
   B. Sequence number.
      1. Version number (V###). Versions are significant complete revision milestones.
      2. Revision number (R###). Internal memory of agreed states of the system; commit logs (significant saves).
5. Access to production (i.e., final production access type):
   A. Personal, common, team service-objects.

3 A real-world design-solution

A.k.a., Intelligent designs, smart solutions, useful system designs.

There are two sub-characterizations of the term, 'real- world' (real world), which related to the common experience of physical matter reality by all individuals, and includes matter and information that is shared (or, shareable) by all individuals. Perception originates from each individual, and each individual exists in a commonly perceptible environment capable of individual expression. Within the context of a real-world composed of consciousness, information, and matter, there are three sub-conceptions of that which is real:

1. **Objectively real:** existing without influence from personal feelings or opinions. That which is real to everyone regardless of mental constructions.
2. **Subjectively real:** existing based on or influenced by personal conscious memory expressed by thoughts, feelings, tastes, and opinions. That which is real to an individual because it is their mental construction.

There is a common objective reality within which exists this physical planetary, earthly, existence for human embodied consciousness. To remain in the body, certain material elements and social conditions must [objectively] cycle through and near an individual's body. Together, humanity can design this cycle cooperatively, and form a network of integrated city systems that follow the same unified [real world] societal model. A real world solution is a solution to overcome the subjective barriers of differently biased mental models within the next societal solution.

Humans exist within an ecological system, wherein human needs and societal solutions can't exist independent of that ecology (all services are sub-systems of that larger ecology). Any real-world solution must account for the flow of resources and information throughout the whole ecological system. In a sense, needs and solutions are subjective, because humans are having a conscious subjective (individual) experience formed from their composition of life experiences. Therein, a societal-level value is a determination of the relative importance of something to everyone based on an objective occurrence of physical events and [information] fields in the real world.

What someone thinks problems are will determine how they are solved. What someone think problems are will drive what responses are viewed as solutions. Solutions only arise from within the framework of acceptable thought. If real solutions are a violation of jurisdictional law, then there are no solutions.

QUESTION: *One might ask, what is the system problem, the root problem (or unclarified project)?*

3.1 The construction of a real-world solution

"If we can really understand the problem, the answer will come out of it, because the answer is not separate from the problem."
- Jiddu Krishnamurti

The construction and execution of any solution includes the following set of real-world elements:

1. **Visualization:** A real-world engineering solution uses object visualization in the form of static images of individual objects and animations of objects in motion, which show mechanisms (a.k.a., objective causes).
2. **Mathematics:** A real-world [engineering] solution uses mathematics to produce effective functioning and safe operations. Here, all real-world engineering products use differential equations to describe relationships between various physical quantities and their rates of change over time or space. Differential equations model the behavior of dynamic systems involved in production processes (and also describe changes over time). Differential equations are used in both mechanical engineering and electrical (EM) engineering. In both disciplines, engineers use various types of differential equations, including ordinary differential equations (ODEs) and partial differential equations (PDEs), to formulate mathematical models representing physical systems, solve engineering problems, design systems, and predict system behaviors under different conditions.
3. **Ability (a.k.a., use, function, work, actability):** 'Ability' represents, the quality of being able to do something, the availability of the information required to complete work, as well as, the presence of a skill [as the expression of a behavior]. In a sense, an "-ability" is the combination of a capacity and a function[al intention of direction] within that capacity. In behavioral terms, an "-ability" is the demonstrated performance to use knowledge and skills when needed. A 'skill' is a proficiency of an adaptively developed behavior pattern (e.g., throwing a ball). In an information system, tools are that which allow the powered performance of a construction task. Here, an -ability may be representational for describing *how* a task is to be carried out to meet a set of capacity and directional relationships.
   A. **Capability (a.k.a., use, function, doability, effective):** is the ability to achieve a desired effect under specified standards and conditions through combinations of ways and means to perform a set of tasks. A capability is a process that can be developed or improved. Adaptive structures are emergent in their "capabilities" because their structures are dynamic.
   B. **Work (a.k.a., activity, tasks):** The time-space, energy-power, human-labor/duty [contextual] relationship of what is being done. The specific type of work (or categorical task) to be done. Work is our understanding of *when* and *where* construction events occur in time-space.
4. **Capacity (a.k.a., limit, threshold, structure, sustainability, regenerability, restorability):** The power to hold, receive or accommodate. Capacity concerns [the amount of] volume, as a measure. Capacity is about structure. Structure forms capacity and is in-formed by ability, the repetition of which can affect structure (and hence, capacity). We can facilitate greater capacity by selecting for different abilities in our [iteratively decided] designs. Practically, capacity refers to the functional ability to do constructive work (i.e., the power to perform a task (or "action"). Capacity is the structural allowance for a construction task; and hence, it understands *why* the construction task is capable of being completed. Here, we ask, "Why do we want the structure we have?" In community, we want a structure for our selectively adaptivity and for access abundance.
5. **Strategy (a.k.a., method, approach):** Temporal planning through the selection of tasks by approach. Strategies describe *what* the work (or task) is to be carried out, and relate it to an intentional direction, which is informed in some [real world] mannered context. From an observational perspective, a 'strategy' is the way an agent [behaviourally] responds to its surroundings and pursues its goals. A strategy is an approach, a manner to achieve an intention. In meta-process modeling (in systems engineering) the connection of two goals with a strategy is called 'section'. A strategy is the mapped representation describing how a system conforms to goal models in the fact that it recognises the concept of a goal, but departs from those by introducing the concept of strategy to attain a goal. An 'approach' is the formation of a strategy; a methodology is the selection of a method; and a design is the whole model. The goal of a strategy, itself, is the definition of a common context according to which tasks are organized and information is transformed. A strategy accounts for uncertainty and orientation (or value) in navigating within the total environmental system. A strategy is a timed response to an environmental challenge. A strategy is a specific course of action to achieve an

objective or objectives. Strategies are modeled and documented in a plan. A strategy is a broad, long term plan for achieving specific goals. A strategy involves the construction of tasks and the selection of projects. 'Planning' is the establishment of a predicted course of navigation (or task, action).

6. **Protocol (a.k.a., procedure, instruction):** The technically mathematical level of operation where a strategy is encoded to become an 'algorithmic protocol'. A protocol orients the iterative transformation of information.
7. **Application (a.k.a., technology):** The repeated performing of a specific task for a functional purpose using computational linguistics. In the design of a system, an 'application' is a task and resource list designed for a functional purpose.
8. **Interface (a.k.a., operation):** A shared boundary across which two separable systems exchange information.
9. **Project (a.k.a., all-coordination):** The coordinated construction of a service application. There are: concluded projects; current projects; new projects; and holding projects.

A real-world solution has two data categories and a variety of material volume adaptability categories:

1. Axiomatic data structure:
   A. Objects.
   B. Concepts.
   C. Needs (life; human and ecological).
2. Changeability of internals.
   A. Adaptability of community standards and protocols (i.e., changeability of concepts).
   B. Adaptability of services (i.e., changeability of needs).
   C. Adaptability of habitats (i.e., changeability of objects).
   D. Adaptability of sectors (i.e., changeability of objects).
   E. Adaptability of dwellings (i.e., changeability of objects).

3.1.1 A real-world solution accounts for feasibility and viability

Feasibility and viability are processes in the common all decisions (solutions) where there is uncertainty:

1. A feasible solution refers to a solution or option that is technically, operationally, or physically possible to implement. In other words, a feasible solution is one that can be executed or realized given the constraints and resources available. Feasibility factors typically include: humans, resources, time, knowledge and skills. Where are solutions analyzed, visualized, and tested to have sufficient certainty that pass an acceptable functional threshold?

   Feasible |FEA.SI.BLE|
   - adjective
   1. capable of being done, effected or accomplished : a feasible plan
   2. probable; likely : a feasible theory
   3. suitable: a road feasible for travel

   Note: Usually used in the context of do-ability, possibility.

2. A viable solution, goes beyond feasibility. A viable solution is not only technically or operationally possible, but also economically, socially, and environmentally sustainable (as in, does not lead to under-capacity/-fulfillment). Where are solutions analyzed, visualized, and tested for an assurance that they will safe habitat and ecological service systems (i.e., sustian the optimal and safe operation of the society's human and ecological fulfillment structure's)?

   Viable |VI.A.BLE|
   - adjective
   1. capable of living
   2. practicable; workable: a viable alternative
   3. having the ability to grow, expand, develop, etc: a new and viable country.

   Note: Usually used in a financial or economic context.

The solution inquiry system designs systematic solutions that are both feasible and viable to orient humanity toward greater fulfillment that when executed. At the level of the habitat, these feasible and viable solutions will be integrated into the habitat service system as existent structure (i.e., an engineered construction) that more greatly fulfill "issued" requirements.

3.1.2 A real-world solution accounts for capacities (i.e., accounts for real-world limits)

A.k.a., Structural limitations on quantities of objects and processes done to objects.

Sustainability is a condition where behavior is able to continue into the future without degenerative consequences. It is possible for the behaviors of a social population of individuals to be sustainable or unsustainable toward one another, and for a social population to have sustainable and unsustainable behaviors in affect to its ecological resource environment. The individual behaviors of people can lead to social network instability/stability and resource network instability/stability.

Some societal configurations are not only unsustainable ecologically, they are also unsustainable socially (culturally), because [in part] they reinforce a competitive over cooperative mindset (Read: a model of artificial limitation becomes reinforced).

3.1.3 A real-world solution accounts for networks

> **CLARIFICATION:** *In an information system, an 'object' is a self-contained package of information describing an 'entity'. A collection of similar objects is commonly called a 'class'.*

A network consists of two or more systems that are linked in order to share resources. This project proposes a societal system composed on an information standard and material network of habitat service systems.

In a networked information system there are two axiomatic lines of visualization:

1. A line between the two interacting objects (point-to-point).
    A. As in chemistry, or the cells as a network, the entities (e.g., the molecules) are capable of interacting, and would be considered the nodes in an information network. When they participate in an reaction together, in the model, they have a line between them. Any ecological system (e.g., an atmosphere) can be represented in this way; its just chemistry. It has the same kind of mathematical representation.
2. A line connecting all objects at once (interconnected points as a coordinate system).
    A. As in principles in physics and operations in mathematics, the entities (e.g., atoms) are all connected at one and the same time through a dimension. For example, when everything about human fulfillment is understood as connected together as one service platform, then all habitat service systems can cycle-iterate together.

Take, for example, a satellite view of the community-city network (global HSS). Each of the cities seen in a satellite view of the city network is a highly integrated city. Each city represents a locally integrated habitat service system for human need fulfillment. When viewing the cities from an satellite view the cities are connected at the physical level via a geometrically efficient network of city nodes, and they are connected at the information-level via a unified information system [network]. Notice the two types of "lines". In the physical network, there are real physical lines (transportation lines, conduits for the movement of physical materials) between the cities (nodes) in the network. However, the information system for the whole societal system, which is physically composed into a network of physical city systems, is a unified information system (the second type of line that connects all things at once). The statement just prior uses the concept "composed into", because any society may be seen, first and foremost, as an information system. When that information system is unified, it is a sign that the societal population is cooperative, and when it is dis-unified, then it is a sign that the societal population is competitive.

> **NOTE:** *It is important to note here that each of the cities in the actualized community-city network will likely not look the same from a satellite view; the current images you see of the city network by the Project are rendered depictions of what the network could look like, and for many of the graphics, the same city image was used for each node.*

3.1.4 A real-world solution accounts for its unified composition

> *A.k.a., Societal unification; unified societal information system; the concept of 'unification' as applied to a society.*

At a simplistic level, to "be unified" means, "works together as a single unit". Thus, the real world solution that accounts for unification of the whole information system within which the spatial system fundamentally exists. In community, the whole societal system, foremost the [transparency of] the information system works together as one unit to facilitate human fulfillment, well-being, and ecological sustainability. In an action sense, to unify is to act commonly (to have common action, to cooperate).

In terms of systems, unified has the following sub-meanings, which are all relevant and required to fully understand the complexity of the concept in its application to a societal system. A unified system is, to start, a system that is observable and explainable as a single, coherent unit. A system where all information in the system can be followed and traced and understood, throughout the system. In computing, the word unified is used to describe two or more processes (methods, etc.) that have been consolidated into one (or a streamlined, most efficient) process. A unified programmable system is programmed together as one unit; there is not patchwork, which is what a lot of people are trying to do with the market-State. If there is a systemic issue, the programmer(s) of the unified system look at the system and resolve(s) a new iteration; they don't place patches over the issues and then just carry on as if there was no error or issue to begin with. The programmers look at root causes, not just symptoms. A unified system is a system where all information within the system can be meaningfully accounted for. It is a system that isn't contradictory, internally (i.e., is not irrational, which early 21st century society is...is irrational, both in language and practice). It is a system where the parts relate to one another in a complementary way to fulfill a common, unifying purpose (for all individuals participating in the system). It is a system with a unifying purpose; and for a humane societal system, that should be to facilitate human well-being, human fulfillment (and ecological sustainability), and should not be anything else (like profit or power over others). It is a system with sub-parts that have been brought together to form a single coherent model/system that is reworked as required, and not, a system with many competing parts or incoherent models, or worse, a patchwork of models. It is a united and synthesized system that works for everyone. The market-State, as a societal system, is not a unified system.

The societal system proposed by the documentation is unified, and is logically sub-divided by the four core (axiomatic) systems that makeup every type of society. If these aren't in-mind then one won't even have an idea of what a society actually is, or what I am even talking about at a fundamental level. Remember I am talking about a societal model that could be named community, and not some community model. A unified societal system must appropriately account for these four fundamental systems, and their interrelationship, and may be logically sub-divided and explicated in these terms.

Unified means unified and complete, given what is currently known, and not dis-unified or incomplete, given what is currently known. The current societal system is dis-unified and incomplete given what is known and available now.

> **INSIGHT:** *When "you" take the widest frame of reference "you" are more likely to end up with the "correct" worldview for that reference (i.e., a world view that can correct a problematic situation).*

Incomplete models raise uncertainty, and uncertainty in our socio-economic survival is unhelpful at least and socio-psychologically destabilizing at worst.

The decision system specification clearly states that even in a community-type society there will still exist uncertainties as decisions that need arrival at with incomplete information and highly limited time. Different societies handle such situations differently due to how their structure's process information. Some uncertainties in a market-State society are highly less likely to be as uncertain when community exists at the societal level. In a community-type society, uncertainty is reduced (over market-State conditions) and not eliminated (as a utopian system may claim). Why are conditions today so unpredictable? It is unpredictable for multiple reasons, some of which humans cannot control for, and others of which humans can control for, but are not being controlled for (or less likely to be controlled for) because of market-State conditions around the world.

Under market-State conditions and beliefs, the word 'unified' is ambiguous, and ambiguously applied, in part, because that type of societal system, and it's language, is not unified. That said, unified is actually a fairly common and well understood term in engineering and communications, and can be highly simplified and de-contextualized to mean - understood, designed, and operated as a single entity.

Unified may also be viewed as a convergence of realization and understanding, through to an integration point arrived at via a self-social team that accepts the new article, standard, protocol, modification, etc.

When accounting for the real-world in the construction of a society, there may be 'commodification' as the dichotomy of unification at the economic level. Commodified means to sell access to, or to do something on commanded commission.

3.1.5 A real-world solution accounts for materiality

The material system of any society, reflects or is computed (and otherwise decided) on the basis of some combination of the following input elements:

1. Data.
2. Knowledge.
3. Values.
4. Decisioning.
5. Location(s).
6. Resources.
7. Tools and techniques.
8. Team(s).

In community, a 'life' is lived in a materially expressed system, where individuals share access through a [common and explicit] rule set. Some of that materiality can be controlled so as to have it more greatly align with some objective(s) on the part of humans, as is the case with the [controlled] habitat city system network within which humans live, primarily. Outside of the habitat city network is the larger natural ecology that humanity controls to a certain [lesser] extent, although a more accurately verb might be 'to caretake'. In other words, humanity caretakes the larger planetary ecology to facilitate its health and regenerative capabilities, while it highly coordinates and controls object constructions of resources ["harnessed" from planetary ecological services] in specific spatial areas of that total planetary material environment. The specific spatial 'areas' in which humanity primarily lives, or more precisely, 'area' (because it is unified), is the global network of integrated city systems. In other words, the global habitat service system is a specific spatial area out of the total planetary spatial ecology where humans highly coordinate and control the flow of resources into access-service systems for human fulfillment.

In materiality, in order to have control, there must be reproducibility of information about materiality; otherwise, there is no ability to align [new] materializations to a common objective. In order to have reproducibility of information among a population, there must be a shared method. Without a shared method, data cannot be compared and actions between individuals cannot be coordinated.

A method is a documented tool, process, set of practices, techniques, procedures or rules, instructions intended to be used repeatedly and consistently to coordinate certain types of work/action. In application, a method prescribes an ordered approach to tasks and activities.

3.1.5.1 The complete dataset component of a material solution

To have a complete [solution] dataset with which to work, it is necessary to determine all possible solutions, and then, synthesize or select the best solution (i.e., select the one optimal, given what is known and available). Most exact solution determination procedures obtain only one optimal solution. However, in some cases, a satisfactory outcome (or best outcome) can be achieved by more than one possible solution; for example, in community, there are customizable cities and personal dwellings (homes).

3.1.5.2 The scheduling component of a material solution

Materiality is experienced in time, where events associated with a common time source are executed together coherently and completely, through 'scheduling'. Scheduling involves constructing a detailed positional model of the operation of the economy (the material system) in order to plan the next iterative state of the integrated societal system, a component of which involves is societal cycle-production planning.

3.1.5.3 What is a thought-responsive environment?

The concept of a 'thought responsive' (a.k.a., thought-responsive) type of environment is significant to a complete understanding of any 'real world' solution [to common human problems], because the real-world environment is thought responsive by its "very" [physical/consciousness-interfaceable] nature. A thought responsive environment is an environment that responds to thought expressed by consciousness through its environmental interfacing vehicle (e.g., the human body). In a more thought-responsive environment, thought can materialize more rapidly, because the technical environment is more advanced in technology. For consciousness, there is thought, and then there is execution of action after/upon thought as a conscious pressure upon, and control over, the environment. What a human being thinks [on this dimension] does not have an immediate impact on its surroundings.

In a low technological environment (Read: low thought responsive environment), the vehicle for consciousness must move physical organs (e.g., musculoskeletal system) in order for any thought to be expressed in the environment. For example, if a human mind thinks, "I want a glass of water", the glass of water does not immediately appear out of nothing -- in order to get one litre of water there must be intentional effort expressed physically through the vehicle (Read: the human body) to acquire the water. Similarly, starting a fire with dried twigs and twine is a low-level technological [thought responsive] type of environment. Today, the environment is more thought responsive than in the past. Today, someone can walk into a room and physically touch a panel on the wall to adjust the temperature, or in some cases, the room can be programmed to adjust to a specific temperature by just walking into it. The progression from (a) starting a fire with twigs, to (b) adjusting temperature by a hand rotated thermostat, to (c) pre-programmed smart rooms to (d) extra smart rooms that can accept purely mental commands (i.e., "you" walk into a room and change the temperature with a mental thought, because the room can read human thought), represents an easily observed increase in the thought responsiveness of the environment, due entirely to scientific and technological development, in conjunction with the ability of the human to control and coordinate its own thought [in order to use more technically complex tools, more precisely].

It is essential to realize that as humanity develops its technological abilities, humanity is likely to develop its environment(s), to even more rapidly, respond to all manner of human intention (Read: human thought).

> **QUESTIONS:** *How do we live together in a highly thought responsive environment? Would a sociological orientation (a social direction) of competition, and power over others, really work out in the long run?*

3.1.5.4 What can humanity do in a more thought responsive environment?

Through embodiment in a bounded system ("vehicle") of matter (e.g., the human body), conscious expresses itself and modifies its environment to more greatly respond to intentions on the part of the consciousness itself. The real-world has material affect on individual vehicles of consciousness, and consciousness experiencing individuality has material affect on a real, commonly experienced world. A material (spatial) environment is the environment through which consciousness is currently experiencing a vehicle for interface (e.g., a human body). If all is information, as this project proposes, then the material (Read: spatial) environment may be referred to as spatial information.

> **APHORISM:** *When experienced together, a more thought responsive environment means we must be more carefully coordinated in our thoughts.*

Values are that which most closely allow for consciousness to account for intentional coordination and alignment in a commonly experienced thought responsive environment. In other words, values may be used to control ("gate") decisioning about how to modify the material environment together. Together, humanity can use values to resolve decisions into state changes to the materially thought responsive world to generate ever greater states of conscious flow, human fulfillment, and ecological regeneration. In a more thought responsive environment human can, together, express more of its highest potential life-fulfilling capabilities.

3.1.5.5 What methods are useful for designing within a thought-responsive environment?

Useful methods for designing thought-responsive material environments are (the methods of linguistic/ meaning and visualization):

1. **Modeling:** Models are formed via methods, and the selection of a method(s) is described by a set of logic. The mind builds a model out of perceptions. Models are static and conceptual (with static meanings/definitions).
2. **Simulating:** Simulation involves constructing a detailed model of the operation of the economy (materialized system) in order to predict how much of each intermediate input will be required to produce the final combination of outputs. Simulations are dynamic and animated (with moving/dynamic objects).

With advances in the technical environment come technologies of potential benefit to all of humanity and technologies for the potential elimination of all of humanity. Any advance in the physical understanding of the nature of the universe may be applied for any purpose. The ever progressing tools of AI (as decision support or social controller), nanotechnology, human computation interfaces, and other powerful technologies reveal that humanity's technological tools are moving the population into an ever increasing thought responsive environment. In order to do so safely, humanity must update its societal direction, models, and modeling approach. Humanity must begin to plan its coordinated life together on a finite planet. Many of the tools present in a highly thought responsive can do major harm rapidly if mis-configured or mishandled. The safest way of entering such an environment is through cooperation, for from competition will inevitably come the re-configuration of otherwise beneficial technologies toward weaponry type-technologies to be used against the competition. It is one thing for "immature" people to run around with sticks and stone, or even knives, or even guns, but it is another thing entirely when some people have the capacity for extremely destructive power at their fingertips, with the same competition/violence-oriented state of mind.

> **NOTE:** *In the physical, a thought has to be translated into physical action to influence the environment.*

It is significant to recognize that there are different levels of thought responsiveness to an physical environmental existence. Competition among humans with nuclear, AI, and other weapons is not equivalent (i.e., same level of environmental thought responsiveness) to that level where competition exists among organisms living in a natural ecology with natural ecological predators and prey. In other words, the interfaceable environment where wild species exist in living predation and scarcity, and thus, competition, is not equivalent to a socio-technically controlled habitat environment where there is sufficient knowledge and materials to build nuclear weapons, AI, and other such technologies.

In community, the problems of need scarcity are solved, not through material abundance (although, there is some of that), but mostly through computational coordination. So much of what is thought of as scarcity in the market is that in order to have a drill, someone must go and buy or rent a minimum viable drill from a hardware store. And so now there is a double problem, you have sunk your capital into a drill, absorbed some of your available space to house the drill, mental space to remember where it is, and under conditions of computational coordination, the drill migrates to your hand the minute you need it, and it's the greatest drill available, and it gathering telemetry on its use, and at its duty cycle it "gracefully" decomposes back into the material stream and is replaced by a drill that embodies all of the new knowledge that can be derived from the telemetry of the last drill.

The reason humans have a pre-frontal cortex is to understand and construct complex linguistic thought [creations]. The human body, as a vehicle of consciousness, has a higher-level of constructive/ destructive potential than that of the other organismal vehicles in "the wild" (living openly on the planet). The rest of the ecological kingdom of organisms can't create technical devices that can destroy themselves and the planet. The competitive ethic (Read: the declaration/ rewarding of winners and looser) is a contrived antagonism that is continually reinforced through the encoding of competitive socio-decisioning structures and social [media] programs. Competitive thinking creates hierarchy through superiority/inferiority thinking from which human violence comes not only predictably, but inevitably [from that though structure].

4 A documented solution

A.k.a., The documentation component of a solution.

A document (file) is an accessible information record. A solution is an accessibly documented information record traceable to a problem. This Project Plan document is a proposal for an open, transparently up-to-date re-configurable society. In terms of coordination, this document defines global cooperation for those entities in coordination. In the context of documentation, a solution is a master plan and all master plans are composed of documentation describing the concept of operation and visualizing the explanation so that so that it is sufficiently detailed and understood to execute it as a decided solution. All solutions are documented, in part, as a series of lists, including lists of resources (base and tools), agents (doers), tasks (Read: events, procedures, and/or instructions), and schedules. A solution is a project, and all projects are sub-composed into a series of executable lists.

Project's are executed as [documented] lists (e.g., materials, tasks, agents, etc.), and therein, [spreadsheets/database] tables allow for the running of mathematical operations of the linear algebraic and statistical method types. Hence, a complete documented solution (master plan) is composed of at least the following sub-documented information:

1. A written description of the coordination of the project to produce and operate a system in response to an issue, including all the parts of a social navigation system, such as: purpose, goals, needs, objectives and values, biases, methods, times, etc.
    A. A written description of the requirements to complete the solution to the issue.
2. A written description, explanation, of the system's operation.
3. A static and dynamic object visualization of the system's operation. A visual 2DD static object image and 3D dynamic object animation.
4. A written description and explanation of the system's construction.
5. A static and dynamic object visualization of the system's construction. A visual 2D static object image and 3D dynamic object animation.
6. A written description of the system's assembly, its parts, and the reasoning for its material and functional selection.
7. A written description and visual model of a system's benefits [to the user and ecology] and its risks [to the user and ecology].
8. Whereas projects are executed as a series of lists, inquiries are executed using qualitative and quantitative analysis:

All design decisions for master plan solutions are executed as projects (i.e., the development side), and, all selected solutions are executed as project's themselves (i.e., the operations side), wherein,

1. Projects are executed as a series of lists inclusive of all required elements, including: resources, people, data, processes, power, analysis, etc.
2. Inquiries about quantitative data can take one of two similar mathematical forms:
    A. Linear algebraic table/matrix calculations (a.k.a., algebraic matrix calculation) to solve for a known variable(s), matrix algebra. The combining of a table(s) of all inputs, processes, and outputs .
    B. Statistical table/matrix calculations to describe patterns in the data for analysis between known and unknown variables; pattern/relationship derivation formula are used (e.g., mean, mode, standard deviation, etc.).
3. Inquiries about qualitative data can take one of several similar forms:
    A. Science-based written assessments in relation to what is, what is required, and what could be.
    B. Survey of need and/or preference.
    C. Survey of ecological services.
    D. Survey of all available resources, people, knowledge, and skills.

More simply,

1. Direction "charter" of written purpose/mission, goals and needs, objectives and values.
2. 2D drawings (2D visualization) of all habitat service systems.
3. 3D simulation (3D visualization) of all habitat service systems.
4. 4D scheduling (task-event calendar setting).
5. 5D costing (estimating finances).
6. 0D investing (action taken to get others to take action).
7. 1D procurement (taking access of materials ready to do scheduled tasks.

The following questions facilitate the resolution of a determination of the completeness and coherency of a documentation system:

1. Are all documents, standards, models and frameworks formally categorized?
2. Are all documents, standards, models and frameworks formally planned, developed, and maintained?
3. Are the users aware of their existence and have access to them?
4. Do all part of the organization follow the same

standards, models and frameworks?
5. Do all parts of the organization operate in a coordinated manner?
6. Are all the parts of the organization linked together?

MAXIM: *Show me the documentation, without which there is no solution.*

4.2 A standardized solution

In the context of formalization (documentation), there is the presence of standards and guides. Standards and guides are essential to the project approach in order to maintain appropriated levels of performance and safety. Standardization documentation facilitates communication between all individuals involved, by providing a common working language and integrated information set. The systems, services and products produced through the use of standards is expected to be safe, reliable and of good quality, if they have been developed by an organization following the standard.

Because society is, at least, a unified [information] system, community is not a multi-standard initiative (i.e., note a many parallel standard environment). There is one unified standard, accounting for everything, within which flexibility exists. The societal information system structured flow of information could be considered the unified standard flow of information; and, in a feedback-integration system, that flow of information evolves (lowers the entropy of) that information system (given, an alignment motive and correction tools). There are of course, many sub-standards, or standard packages and sub-packages of this type of information.

A global reference standard [solution] is an optimally solved for outcome (or, state-result), given what is known. Standards are developed through the iterative process of building an increasingly lower entropic [information] system. A standard is an optimal function-based and/or condition-based solution information set with use for creation at some social scale. Standards are developed, adapted, updated, modified, changed, and otherwise, replaced over time, as more information becomes known.

All useful standards describe the importance of understanding the scope of the work at hand, how to plan for critical activities, how to manage efforts while reducing risk, and how to successfully resolve the problem space.

- A **standard** is a document that provides requirements, specifications or guidelines to ensure that products, processes and services fit their purpose (ISO/IEC 2008).

There are many sub-types of standards:

1. Design standards - the societal design specifications are design standards.
2. Requirements standards.
3. Operations standards.
4. Etc.

A technical [reference] standard is a formal information set (document) that establishes uniform technical (or engineering) criteria, methods, processes, and practices. Standards are developed and applied to make uniform (or standard) some [existent or possibly existent] object or relationship.

CLARIFICATION: *When a technical standard is applied to operations (to be executed at some time), then it is generally called a 'protocol' or 'procedure'.*

By implementing standards (including standardized procedures) for development and operations, a life-cycle process allows for the optimization of efficiency in the following ways:

1. Allows for an assessment of alignment.
2. Minimizes interruptions.
3. Increases visibility.
4. Reduces risk of loss.
5. Optimizes lifespan.
6. Mitigates security and performance issues.

The order of conceptual formalization for the composition of a reference standard is:

- Concepts > principles > processes > standards.

In early 21st century society, the term 'standard' is applied to more than just the technical context. Thus, technical standards exist in contrast to:

1. **De facto standards** - a custom or convention or technical standard that has achieved a dominant position by public acceptance or market forces.
2. **Policies** - the decisions of subjective authority, as opposed to algorithmic decisioning.
3. **Conventions (customs)** - locally evolved signs and semantics (as in, semiotics), as opposed to globally unified signs.
4. **Business standards** - subjective decisioning by market-structured "board" authority, versus objective human-oriented decisioning.
5. **Political standards** - subjective decisioning by government-structured "committee" or "chair" authority, versus objective ecologically-oriented decisioning. Note here that the term, "chair" literally comes from royal, monarchic chair.

NOTE: *In common parlance, SAS stands for "standards aligned systems" (as in, systems that are developed and/or operate in alignment with some standard).*

4.3 A simulated solution

A.k.a., Digital twin, habitat simulation, city simulation.

Simulation allows people to see the data. Creating a simulation (digital twins) is a powerful tool for visualizing and analyzing data related to societal decisions and operations. Simulations are animated virtual models that replicate physical objects, processes, and systems. In the case of society, simulation provides an interactive three-dimensional (3D) virtual [reality] model of the conceptual and physical systems, including being able to point to an existing location and acquire all information on the location, types and density of objects, as well as any concepts and objectives that may be present. It is also possible to simulate the impact of different configurations of the conceptual and material world, and different choices, to determine interventions that are more likely to be effective in the real-world at resolving real-world problems.

The best way of conveying understanding is through simulation, which convey realism with the real-world objects and account for real-world data. Lack of realism disrupts understanding, hindering the effectiveness of learning (or, training). A truly useful simulation of the master plan solution would be:

1. Consistent with the real-world.
2. A representation that covers all societally relevant aspects.
3. Integrated raster and terrain data.
4. Embedded semantic segmentation (BIM and OIM categorization and meta-data associated with geometry).
5. The habitat network, including all infrastructure, in 3D without gaps or missing areas.
6. Realistic 3D quality comparable to a AAA video game.
7. High-performance for efficient computation and high frame-rates.
8. Scalable for use in massive multi-player and massive agent applications.

A simulation is highly changeable (controllable). It is possible to apply changes to the digital model and make hypothesis of what might happen in the real-life world, to anticipate changes and arrive at greater certainty around fulfillment-based causal chains of cause of effect. The same change (control) can then be applied to the physical world after it has been tested in the simulated one. Productive assembly units in the real world can mirror their simulated ("digital twin") units. Decision working groups can move back and forth between the real-world and software simulation (digital model) to understand what happens behind each interaction, where each object comes from, and how the socio-technical and mechanistic model works. This can all be done to improve production, and extends to individuals understandings of themselves within a real-world. Using simulation, designers, deciders and engineers, simulate and construct an optimized platform for global human need fulfillment.

4.4 A solution specification

A.k.a., What is the 'specification' of a solution?

A specification is produced in advance of the systems construction, implementation, and/or operation. It is good practice to separating the [design] specification from the specification for physical implementation and operation of the product system. As a coder (designer and developer), a specification is required to know when a process (task or project) is completely done. Without a specification, there is no ability to recognize how many sub-deliverables (subtasks and milestones) there are to get to this "thing".

Design specifications are an attempt to imagine the thing "we" are trying to build. "We" are trying to build an image of the thing "we" are representing. "We" build the model, and then, "we" build the thing in[to] materiality. Which feeds-back onto our own experience of existence (through a set of pre-defining rules). Wherein, there are more than could be seen as here should be all around.

> **CLARIFICATION:** *Design the system by developing the specification. Then develop the system by constructing the specification.*

All real-world solutions are specifically represented by:

1. **Objects: Point to objects (as in, static objects).**
   A. Point to and name objects (a.k.a., resources, materials technical units, assembly units, configuration units) in the service system.
   B. Show object labels.
   C. Show cross-sections.
   D. Show measurements.
2. **Concepts: Define concepts are relations between objects (as in, static concepts and dynamic concepts).**
   A. Define requirements of the service solution system.
   B. Define functions, processes, and operations of the service solution system.
3. **Animation: Visualize the motion of objects (as in, objects in motion, dynamic objects).**
   A. Show 3D objects in motion (a.k.a., animation, movie).
   B. Show measurements.
   C. Explain cause(s) of motions of objects.
4. **Operation:** Write and draw a manual for the construction and operation of the service solution system.

In systems assembly modeling,

1. A specification is anything that describes what an actual instance [of the system] looks like.
2. A description is a kind of specification that contains the actual description of the instance in place.
3. An explanation is a kind of specification that contains the actual reasoning of the instance in place.
4. A declaration is a place-holder for an instance.
5. A definition is the assignation of an actual instance to a declared place-holder. A definition, thus associates a specification to a declaration.
6. A reference is a kind of "specification" whose value is provided by a "declaration" it references.

In engineering, a [construction] specification is the fully conceived vision; the fully visualized input for execution. In other words, a specification is a specific visualization of information useful to state change execution in the material, real-world environment. The system or product, as specified in the specification, is constructed from this process, formed from its set of [specified] requirements. Specifications exist in many information medium formats, including the most common of: *linguistic* text, *graphic* drawings and computronic *simulations*. Note here that the suffix "-tronic" means a device or tool; hence, computronic means computational tool).

> **NOTE:** *A constructor (the entity building/constructing something) gets all the information that is necessary to build the structure from the specification (a.k.a., the blueprint).*

Visualized requirements will contain a level of accuracy and complexity. Below is the reasoning for requirement level selection:

1. **As a means of facilitating discussion** about an existing or proposed system.
   A. Incomplete and incorrect models are OK as their role is to support discussion.
2. **As a way of documenting** an existing system.
   A. Models should be accurate representations of the system, but need not be complete.
3. **As a detailed system description** that can be used to generate a system implementation.
   A. Models have to be both correct and complete.

A specification is the discussion of a specific point or issue; it's hard in this instance to avoid the circular reference. A specifications consist of the body of information that is informed by and guides project designers, developers, engineers, and operators through the work of creating and operating the system. A specification document describes how something is supposed to be done (i.e., it describes a process of creation), including a rationale (i.e., it describes the reason for creation, or for a specific creation). This document may be very detailed, defining the minutia of the implementation; for example, a specifications document may list out all of the possible error states for a certain form, along with all of the error messages that should be displayed to the user. The specifications may describe the steps of any functional interaction, and the order in which they should be followed by the user. A specification meets a set of requirements by expressing information via the conceptual, logical, and visual domains of expression. Hence, specifications may take multiple forms. Specifications can be composed of a straightforward listing of functional attributes, they can be diagrams or schematics of functional relationships, flow logic, or they can occupy some middle ground. Specifications can also be in the form of prototypes, mockups, and models.

Specifications may take many forms. They can be a straightforward listing of functional attributes, they can be diagrams or schematics of functional relationships or flow logic, and they can form of language and math compositions, prototypes, mockups, models, simulations, and some combination thereof. Every rule and functional relationship provides a test point. Adherence to specification is not a perfect measure, however.

A specification necessitates the following synchronous, hierarchically ordered information processing components:

1. A "specification" is anything that describes what an actual instance of the [designed] system looks like.
2. A "description" is a kind of "specification" that contains the actual description of the instance in place.
3. A "declaration" is a placeholder for an instance.
4. A "definition" is the assignation of an actual instance to a declared placeholder. A "definition" thus associates a "specification" to a "declaration".

Engineering documents describe the product[ively materialized system] in different ways from different perspectives, for different purposes, and at different levels of detail or approximation or abstraction. The most abstract documents are the overall system specifications, answering the question 'what does it do?' in terms of the properties of the product that are of interest to its users. Other more detailed design documents, plans, models, blueprints, etc. summarize an answer the question 'How does it work?'. Specifications also exist so that past and future states can be cross-referenced.

The process of engineering design and development is to construct specifications. The engineering specification (or product design/requirements specification, often "spec") is a critical document in the creation of any system. The engineering specification document is one of the best indications of a well-engineered product. The engineering specification (or product design/

requirements specification, often "spec") is a critical document in the creation of every hardware product.

1. **Ideal specification (ideal specification)** - This documentation is the most detailed and unified specification possible. Even though this is necessary for a societal-level system, this requires a lot of overhead and is usually ignored by most market-base organization (because of its heavy intellectual overhead, reasoning). This spec is necessary if something is to safely engineered into a complex and dynamic human social experience.
2. **Working specification (working specification)** - This is usually a shared outline broken down by requirement groups, and is used for easy referencing during development.
3. **Prototyping** - Once there is information documented in the specification, each requirement is traced with a solution. This culminates in a prototype that often looks quite different from the final product, but reliably functions and meets each requirement of the specification. The works-like prototype is built to answer a large number of questions uncovered by developing the engineering requirements: core function, component selection, mechanics, feel, and assembly.

There are many types of specifications, the primary types include, but not necessarily limited to:

1. Requirements specification.
2. Design specification.
3. Testing specification.
4. Operating (and maintenance) specification.

Specifications, like any formal documentation, can take different information-compositional forms, the two most common are:

1. **Mathematics (patterning logic)** is [in part] the representation of real objects using numerical conception and equational logic.
   A. Mathematics are descriptions of material attributes of the system.
2. **Visualization (graphic logic)** is [in part] the representation of real objects using spatial (-illumination) conception and discrete mathematics (Read: graphs).
   A. Visualizations are explanations, wherein a mechanism can be understood by looking at a spatial visualization (or simulation) of the behavior of the system.

For societal systems, there are two sets of specification information:

1. **Core functions** of system - functional interface; a description to use.
   A. What does the system do for its user?
2. **Compositional conditions** of system - infrastructural interface; an explanation to understand.
   A. How does the system do what it does for its user?

Describing and explaining is accomplished through:

1. Quantitative (numerical and mathematical [materialized as operational] logic), and
2. Qualitative (linguistic-conceptual, simulation and visual-spatial [information system] logic.

Together, a unified information system integrates an all-ways view of the total information in its organization. 'Qualitative' and 'quantitative' methods (logic[al methods of processing]) are applied to resolve the society's functionally operative system(s). Each new set of resulting information, modifies the present information set of 'fact' (i.e., labeled as). A 'fact ' can be a category label for an instruction that will execute an operation automatically in the environment. For example, it is a fact that that which can be commonly labeled as a "Universal serial bus, USB input male "will fit" into a USB input female, to complete a function; or, that there exists a spatial information sub-set of plant molecules, only presently known as "alkaloids") The presence of that category 'fact' conveys the meaning of another choice, an opportunity. Each new idea building a stronger, more cohesively integrated system through increasing factual understanding, building a factually unified information system for a socio-technically optimum solution.

It is sometimes said that 'community' is the natural outcome of a sufficient amount of experience and processing of life information. For it is the natural resulting understanding of what must essentially occur, or change, to orient all individual humans together toward flourishing for all affected.

There are a variety of types of specifications, for instance, there is a:

- Building specification - a set of instructions on how to build the system per the specification.

A complete specification is representational of a unified view of a system:

1. It is a reduction (reducible) - the view of the system as a whole is broken down into a listing of separate, discrete statements.
   A. The process of reduction accounts for a system by reducing the system to its constituent components. These are sufficiently subdivided so that each individual component behaves

as if it were a simple system displaying only a few variables, all of which lend themselves to common analytical treatment. The sum of the behavior of the individual components is assumed to provide the system properties. The partitioning of the system into analytically tractable components. System analysis is, by definition, a reduction.

2. It is an integration - the information represents a complete visualization of what the system will be like when it is complete.

The communications properties (communications plan attributes) of a specification (model) include:

1. Annotated.
2. Appropriate (relevant).
3. Complete.
4. Conceptually clean (clear definitions and relationships).
5. Consistent.
6. Constructible.
7. Correct.
8. Executable.
9. Formal.
10. Minimal.
11. Modifiable.
12. Non-redundant.
13. Precise.
14. Reasoned.
15. Testable.
16. Traceable.
17. Unambiguous.
18. Understandable / readable.
19. Verifiable.

4.4.1 A specified systems definition

The first form of a communication of (about) a system is the communication of its systems definition, of which there are two types:

1. **A construct-able definition of the system**: take the definition of the system, and the system's design specification, and show that the system design specification meets, or does not meet, the system's [objective] definition. Here, definitions can be reduced to mathematical terms as objectives flow into conceptual requirements and then quantity requirements in the form of a specification to be constructed, and then a measurement of the constructed system itself and its impact on the environment. The system's design specification (and eventually, its materialization and affect) is demonstrated/proven mathematically that the systems design satisfies its definition.
    A. Take the definition and work to develop (or, discover) system designs that optimally satisfy.
2. **A discover-able definition of the system**: if it is not possible, given the information available (Read: the theory), to match the system's behavior (as a design specification) to its definition (Read: its model). Here, there is scientific inquiry -- all that can be done is to do an experiment to see if the system observably behaves like the model (Read: the definition).
    A. Take the system and work to discover (or, develop) system definitions that optimally satisfy.

4.4.2 The purpose of a design specification

A design specification involves the integration of multiple perceptual information sets into the resolved determination of single design represented in the form of an object called a [design] specification, which is a synthesis.

The purpose of design when creating a 'specification' object is to complete the following objectives:

1. Define what is to be built, decide how it behaves, select how it is composed.
2. Communicate enough detail for construction, operation, and optimization.
3. Act as an object reference for all deliverables/ milestones.
4. State what the system component is, not just its functionality.
5. Every statement logical and/or verifiable, and ready for integration tests with attributes to track states and methods of verification.

> **CLARIFICATION:** *Engineering development, unlike engineering operations, is largely concerned with design. Engineering operations is largely concerned with the actual operation of some system that was previously designed.*

4.4.2.1 What is design?

Design is understood as purposeful and deliberate activity (intervention) that succeeds in establishing new structures and processes, or rearranging existing ones, thereby achieving intended outcomes and improvements. The result of design is a synthesis, known as a 'specification', that can be constructed in the real-world. Design represents the building of a relationship between us and our world. The purpose of a design is to serve as a [meaningful and visual] representation of the goals it represents. If a purpose is a reason for being, then all designs are purposeful (i.e., all designs have a purpose). In this sense, design is simply the purposeful arrangement of parts. In practice, design is purposeful planning. Fundamentally, engineering design is a purposeful activity directed toward the goal of fulfilling human needs. Design is the purposeful building of a product and experience that solves the problem. A design process is a purposeful method of planning practical solutions to problems.

Design is not speculation, but knowledge and the competence to use the knowledge to resolve a problem as expected. Design is not planning. Planning moves out from the existing state, producing (in a time-frame) a step-by-step progression of what to do. Design identifies the here and now, in order to create and model a new human solution system. Design is not "improvement of the existing system". A design "is the new system". In this sense, humankind is not designing for the future, humankind is designing the future.

In design, setting goals and specifications emerges in the course of the design inquiry as a result of constant integration and the encoding of value-based inquiry selections. Values orient decisioning so that decisions satisfy their intentional decider's needed conditions [for development and operation, together].

In practice, the concept of design (Read: concept in operation) has, at least, the following sub-composition:

1. Design as a noun - the system ("thing") designed.
2. Design as a verb - the activity of designing.
3. Designer - the [intelligent] entity taking design decisions.
4. User - the entity using, operating, or otherwise applying the design.

> **NOTE:** *Specific societal questions can be answered through scientific inquiry and/or technological design.*

Every design activity that finally leads to a physical system of the designer's conception must necessarily apply technical factors (i.e., to materialize anything, technical materialization factors must be applied). Among society, every design activity that leads to a physical designer's conception must necessarily apply socially conditional factors expressed within a [coordinated] decision system.

4.4.2.2 Design thinking

Design thinking is a tool for intentionally constructing meaningful and useful environments. It is useful for constructing environments that have the [designed] abilities to meet our needs in an orientationally similar manner to our values and overall explicitly objective direction (i.e., to that which is meaningful). Here, a common decisioning space requires an explicitly designed thinking process[ing structure]. 'Design thinking,' as it is commonly known, is sub-composed [in part] of *requirements (tasks)* and *-abilities (the ability to do work in an directed manner; i.e., intentional constructors)*.

At a high-level, the common decisioning space process a set of requirements that are fed into a design[ed] system, which processes information (and otherwise, calculates) if the design has the total '-ability' to be brought into habitat serviced production. Herein, a designed solution (the output of the *Solution Inquiry* process) is fed through a set of design -ability 'inquiries'. Within the inquires lie protocols designed by the community of users to transform [information] resources in ways that are fulfilling to all participators in the community (i.e., with the -ability to orient toward fulfillment). In community 'design thinking' there are three general information sets (or "valued awareness's"):

1. **Viability** - as eco-logical consideration.
2. **Desirability** - as human-ological consideration with localization, modularization (i.e., modular customization, and aesthetics).
3. **Feasibility** - as technically possible.

Something that is selectively adaptive in [designed] response to an environment is:

1. **Technically feasible (a.k.a., physically feasible)** - it actually works or functions in the real world.
2. **Ecologically viable (a.k.a., scientifically feasible)** - it is ecologically safe in its operation [and predictably unlikely to cause harm to self, others and ecosystem services].
3. **Humanely desirable (individually-socially desirable)** - it meets human need fulfillment, and does so sufficiently and at a frequent interval (i.e., frequency fulfillment needs). It fulfills our "issued" requirements.

4.4.2.3 The design process

> *A.k.a., The design life-cycle, the visualization process, the modeling process, the model cycle.*

All design is an action, a process of visualization. Processes may be broken down into steps. The design process is characterized by:

1. **Initiating information:** The process begins with some initial information, often related to the desired outcome or intended effect of the design. This information serves as the starting point for the design.
2. **Visual model:** A visual model is created based on the initiating information. This model represents the envisioned design, providing a visual representation of how the final product or system should look and function.
3. **Resolution of model:** Each component or part of the visual model is examined and analyzed. If there are unresolved issues or questions about any aspect of the design, new information (inquiry) is sought, and these issues are resolved. This iterative

process continues until all aspects of the design are addressed.

4. **Satisfaction of requirements by model:** The design process continues until all stakeholders involved in the project are satisfied with the proposed design. This means that the design meets the specified requirements and aligns with the intended goals.
5. **Agreement upon final model:** Once all elements of the design are determined and everyone agrees on the system's specifications and requirements, the design is considered finalized. This stage represents the culmination of the design process, where all aspects are agreed upon.
6. **[Socio-]Technology fabrication and operation of model:** In some cases, the design process may extend further into the description of the technology (or, socio-technical) fabrication and system operation processes. This involves specifying how the design will be turned into a physical or functional reality, including manufacturing and/or implementation details.

This sequence forms a hierarchy of correlated transformations of systems descriptions over multiple levels of structural resolution (scale).

Design decisions derive from:

1. **Information precedence** - situational report as well as what has and has not worked before.
2. **Information patterns** - recognizable functional or material structure seen to work in different situations and having an equivalent architectural form in a different circumstance.
3. **Information equivalence** - known, technological realisable characteristics and interactions that are aspects of the outcome sought.
4. **Incremental variation** - empirical deviations that explore successive solution directions.

Design mechanisms in the [design] process include, but are not limited to:

- Thinking; modeling; visualizing; simulating; systems thinking; visual reasoning; boundary building; model visualization; specification visualization; abstraction leveling; information transformation, interpolation; dialectics; scaling; pattern recognition; pattern matching; extrapolation; and, interpolation.

4.4.2.4 Design software

In material engineering, the process from conceptualization to implementation involves a precise and systematic approach. This process demands the utilization of advanced design software, capable of producing solutions that prioritize safety, reliability, effectiveness, and efficiency. These software tools have become the foundation of modern material engineering, aiding engineers in crafting intricate mechanisms and socio-technical human systems, modeling complex assemblies, and generating comprehensive object models with detailed associated information. Furthermore, programming software plays a pivotal role in developing information processing software and intelligent agents that enhance the capabilities of these systems.

The following are the types of design software that are typically used to engineer safe, reliable, effective, and efficient solutions to material problems:

1. **Computer aided design (CAD; a.k.a., computer-aided design)** tools to produce accurately modeled mechanisms and socio-technical human systems.
2. **Computer aided engineering (CAE; a.k.a., computer-aided engineering)** tools to produce accurately modeled assemblies.
3. **Building information modeling (a.k.a., object information modeling)** tools to produce complete object models where all geometry has associated information.
4. **Programming (a.k..a., computational) software** tools to produce information processing software and intelligent software agents.

4.4.2.5 Design analysis produces factual 'certainty' representations

Design analysis is concerned with decomposition and reduction, as [well as] equally concerned with design synthesis, composition and holism (through motion in time). When the design process has been navigated to a satisfactory resolution, then commensurate contributions of effort and creativity will have been expended from both analysis and synthesis.

4.4.2.6 Design modeling produces an synthetic likeness of the real world

In the broadest sense, a model is the use of something in place of something else for some cognitive purpose. A model represents reality for the given purpose; the model is an abstraction of reality.

Model types:

1. Structure - 1D, 2D, 3D models, systems, subsystems, components, modules, classes and interfaces (inputs and outputs).
2. Behavior (functionality).
3. Timing (concurrency, interaction).
4. Resources (environment).
5. Metamodels (models about models).

4.4.2.7 Design breakdown ensure completeness

A unified design can be separated into parts. The two material design process sub-parts are:

1. The **functional architecture** identifies and structures the allocated functional and performance requirements. An input and output interface representation.
2. The **physical architecture** depicts the system broken down into subsystems and elements. A structurally composition representation.

4.4.2.8 Interface (visualization) design resolving

The most important interface design [operational-conditional] principle is: usability. The interface is being designed to literally 'interface' with another system, and so, it must do this effectively for both systems. Humans and other necessary systems can interact with the target system in a way that allows them to achieve their purposes in an efficient and effective manner.

4.4.2.9 Material system design resolving

In any materialized system there are material objects [and physics relationships], and then, within the human context, there are also relationships between those material objects. Hence, when a material system exists, there are objects (a.k.a., resources) and their associated material-physics location, which is understood by humans through a conceptual coordinate system. More simple, material design must account for objects, their relationships [to humans], and a coordinate system relating the objects to one another.

4.4.2.10 The design-model process

A 'design' can be defined as a 'model' of an 'entity' to be 'realised', as an instruction for the next step in the creation process. An entity model can be an object or a process. The model can take various forms, like a drawing or a set of drawings, but can also have various other forms, such as a text, a flowchart, a scale model, a computer 3D-representation, and so on.

In the life-cycle of creation, a design is not an end in itself, but an input for the next step, which can consist of further updating the design in the immaterial domain (i.e., the information domain of creation) or of the actual realisation of the entity in the material domain (i.e., the materialized domain of creation).

A model is an abstraction of reality. Usually, a model is an abstraction of an already existing reality, but in the case of a design, it is a model of a possible future reality.

This design, the model of the entity to be realized, should satisfy the so-called principle of minimal specification. It should give all the information the makers (i.e., creators, designers, developers, constructors) of the entity need to realize this entity as intended by the designer. A design is not only necessary to realize the entity, it should also be sufficient.

The object (or process) to be designed has to fulfil a certain function for the user. Designing can simply be defined as making a design, but a more specific definition is: Designing is the process of determining the required function of an object to be designed, combined with making a model of it. Designing is the development of a functional specification of the object to be designed, combined with making a technical specification of it; specifying the object in such a way that the makers of the object will have sufficient information to produce it.

A design process should produce an object design and, if needed, a realization design. A professional design process itself should be executed on the basis of an explicit process design. That process design specifies in principle the undisturbed process.

4.4.2.11 A 'specification' is 'the model' of a solution

> **NOTE:** *A model of a system should contain all elements that are relevant to the functioning of the system. A specification is a visualization of information (linguistic and/or spatial, etc.).*

Models, as the result of modeling, are prime instruments of individual reasoning and explicit enabling mechanisms of social reasoning. Everything in physics, in engineering, is a model. A model is a set if conceptions (meanings) about the ways some thing (a system) works. A model explains the facts, conveying the experience of meaning to subjective consciousness. Models are judged solely by what they deliver once acted upon. Models inherently have uncertainty given a dynamic.

> **NOTE:** *In some cases, the word 'knowledge' is just another word for 'model', and 'model' is another word for "method of determining".*

Data models are representations of human understanding Data models are representations of data structures used by information systems Data models (and conceptual models) are representations of human understanding or knowledge; semantics is a purely human phenomena and data models can be used as a representation of domain semantics. Therefore, any evaluations of data model quality must ultimately appeal to the perceptions of the people that use the model.

> **NOTE:** *Minds are, in part, [analyzing] modeling machines, and modeling (which comes from perception, which comes from information received) can go "wrong". Computers are, in part, [synthesized] modeling machines outside of minds, and thus, useful tools for modeling together.*

Models are (or, may be) information about the world that allows us to "do things", extends and generates capabilities (-abilities, functions), that allow designing users ("us") to generate structures that wouldn't be possible without knowledge. In this sense, intelligence refers to systems that have knowledge (or information) that allows them to generate structures that wouldn't be possible without having knowledge. There is no possibility that there would be peaceful, compassionate, technological civilization unless we had a population with intelligence (and knowledge) about the principles of physics and of human life.

The shape-based layered [data] design model:

1. **1D model** - is concept.
   A. For example, 'water'.
2. **2D modeling** - a geometric [graphic, spatial] model of an object as a two-dimensional "figure", usually on the euclidean or Cartesian plane.
   A. For example, an area (or surface) of 'water'.
3. **3D solid modeling** - the process of developing a mathematical representation of any three-dimensional surface of an object (either inanimate or living) via specialized software.
   A. For example, a simulation of the motion of a volume of water through some duration of time.
   B. **3D solid model** - the product of 3D solid modeling.

NOTE: *1D, 2D & 3D models have simulation and analysis capabilities (mostly physics-based) are common in practice.*

Technical model descriptions include:

1. **Object description** - description of shape of something.
   A. **Object identification** - description of shape in relation to other shapes.
2. **Operational definition** (a.k.a., functional definition, technical description) - description of what something is observed to do.
3. **System explanation (a.k.a., visualized definition)** - visual reasoning (simulation to the level of technical capability possible) for how and why to build something to be observed to do something.

An operational definition allows for measurement of the variable of interest.

Models are created for a variety of purposes:

1. **Analytical Inquiry** - understanding the components and workings of an observed phenomena.
2. **Behavior Analysis and Prediction (descriptive)** - understanding the possible behaviors and predicting the behavior of a phenomena.
3. **Conveyance of knowledge (descriptive)** - the transmission of the understanding of a phenomena from one person to another.
4. **Specification and control (prescriptive)** - the declaration of what and how a phenomena is to be realized or manifested by human agents.
5. **Representation and display (representative)** - a simulation or copy of phenomena for entertainment or guidance.

NOTE: *Modeling and simulation tools are required for systems engineering. Modeling and simulation are used to analyze the system processes before finalizing all of the details of the process; the very essences of models provide the ability to simulate the steps through design, production, and operation; this creates new ways to increase the assurance that the designed system is producible and effective.*

4.4.2.12 The constrained structure of a solution

INSIGHT: C*onstraints can be (i.e., can create) opportunities.*

Project planning decision constraints as requirements:

1. **Scope constraints** - objective to social, user, engineering requirements
2. **Time constraints** - schedule requirements
3. **Resource constraints** - resource requirements

Constraints are limitations and/or boundaries, often environmentally and/or pre-set. Constraints are conditions that exist because of limitations imposed by external elements, including interfaces, support, technology, resources, etc. Constraints bound the development teams' design.

For any project there are two core types of constraints:

1. **Limitations on the solution** itself (i.e., on the system).
2. **Limitations on how the project** (to develop/operate the system) is run.

For example,

- ID: CNST-001; Constraint - all building permits must be obtained 1 week before the work can start; Constraint type (physical, legal, regulatory-policy): Legal

4.4.2.13 Critical solution success factors

A critical solution success factor is a testable criteria representational of a minimal measure of project's success or failure.

For example,

- ID: CSF-001; Critical success factor: The kitchen remodeled must be finished by November 15, so we can use the kitchen for...

4.4.2.14 Critical assumption factors

A critical assumption factor is an integration that affects decisioning, but can't be known (or, isn't fully known to) at the time of decisioning. Assumptions are sought minimization to increase the certainty of every decision. Assumptions may be decisions outside the project team's control that influences actions/inactions on the project.

In a unified societal system, many of the assumptions present in the market are not present. For example, which may not be knowable in the market, and hence would be an assumption, is knowable in a unified societal system,

1. ID: A-001; Assumption: The pending wood and labor shortage will not impact the availability for wood for kitchen cabinets or pool decking surfaces.
2. ID: A-002; Assumption: The kitchen window view of the pool will not be blocked as a result of either the landscape update or pool upgrade.

5 A system's life-cycle

A.K.A., *What is a system's cyclical process, period, phase, stage, gate, life cycle, lifecycle.*

In order to understand any system, it must be understood that every [existent] system has a life-cycle (i.e., is associated with a life-cycle). Every system has a life-cycle and it progresses through its life-cycle as the result of actions, performed and coordinated by people in an organization, using processes for execution of these actions.

5.1 Basic examples of life-cycles

The basic example of a life-cycle to economically fulfill humanity through the operation of a service:

1. Order inquiry.
2. Confirm order.
3. Plan service.
4. Fill/assemble order.
5. Deliver order.
6. Verify order.
7. Operate order.
8. Recycle order.

The basic example of a life-cycle to develop an operational service:

1. Describe situational context and issue.
2. Define system requirements.
3. Select technology modules.
4. Assemble system.
5. Validate system.
6. Operation and iteration system.

The basic example of a life-cycle to utilize an operational service:

1. Exploratory research.
2. Concept.
3. Development.
4. Production.
5. Utilization.
6. Support .
7. De-cycling/retirement.

The basic example of a life-cycle to discover a new technical function:

1. Exploratory *discovery.*
2. Controllable observational *study.*
3. Re-visualization of *understanding.*
4. Re-production and re-test with new *discovery.*

The basic example of a unified access [control] protocol that functions to sustain the necessary abilities to coordinate optimality by means of the following control process (a critical method type):

1. **User** [information interface] sign-in function.
2. **Issuance** of.
   A. Authentication.
   B. Revocation of authentication.
   C. Transfer of authentication.
3. **Verified** individual.
   A. Establish existence (by sensation).
   B. Resolve identity (resolution).
   C. Validate identity (Validation).
   D. Verify identity (Verification).
4. **Authorization** individual (accountable to change of system).
   A. Open access [to resources].
      1. Authorization sub-types of changes to access, such as *read* and *edit*).
   B. Observation log (monitoring).
   C. InterSystem team role (enrolment; tasking, accountability, and resource assignment).
5. **Digital and physical** identity (file specification).
   A. User experience - is the interface intuitive?
   B. User notification - is there a need for notifying?
   C. User access - to what location and resource is a user to access.
      1. User personal access (personal space).
      2. User community access (common space).
      3. User InterSystem access (engineering space).
      4. User restricted access (emergency space).

Here, existence is (refers to) identity -- can the system (solution) be identified (or, differentiated)? If it can, then it exists, and if it cannot, then it does not exist, given a temporal environment. In logic this conceptual formulation is sometimes called, "the law of identity".

To fully understand that every system has a life-cycle, three logic-based sub-conceptions are required:

1. **Pattern** - replication and definition [of something identical with itself].
2. **Identity** - existence and association [of something identical with itself])
3. **Recognition** - computation for integration [of something identical with itself].

Logic allows for determination (decisioning). There are three "laws" [of thought] that form the basis of all logic[al thought]: "law of non-contradiction", and "the law of excluded middle", the "law of identity" (these are elaborated upon in the social system). A society may apply these three principles ("laws") to their [constructed] information system to more accurately (thoughtfully) model and decide a given optimal direction (such as, human fulfillment and ecological sustainability).

5.2 The life-cycle of a real-world societal system

Specifically, in the real-world context of systems engineering, there is are two axiomatic, logical information sets:

1. **The engineering development process**, wherein a system is designed and developed [through a life-cycle, which includes information and material and energy flows in time].
   A. For example, the development of a societal system, including a unified information system and a the habitat service system.
2. **The engineering operations process**, wherein a system is operated and maintained [through a life-cycle, which includes information and material and energy flows in time].
   A. For example, the operation of an information system, and a habitat service system; of which, the habitat service system consists of a network of integrated city systems that originate from and operate through a unified information system.
3. **The habitat service systems process**(es), wherein a materially interface-able system coordinates and outputs a current state[-dynamic] of fulfillment.
   A. For example, the life-support power sub-system that uses material resources and provides power to the residential sector of the local habitat service system.

Using the systems science approach a real world system's life-cycle may be decomposed into 'development' and 'operations' activities (recursively, 'development' is itself an 'operation'):

1. In concern to **system development**, a set of system [development] life cycle processes (information phase sets; solution inquiry processes) must be capable of:
   A. Information modeling.
   B. Acting upon an intentionally constructive set of information (a problem-solution), material, and energy flows to bring a specified system into existence, developing a systems next iteration.
2. In concern to **system operation**, a set of system [operation] life cycle processes (information phase sets; habitat operational processes) must be capable of:
   A. Information modeling (modeling a set of information, material, and energy flows that enables actions, transformations, and outcomes as intended throughout the system's life span.
   B. Acting upon a temporally associated information

set using materials and energy to operate a specified system, sustaining an existent system's persistence.

A discrete life-cycle is subject to the constraining dynamics through which it operates:

1. A set of starting or input conditions that arise from circumstances and environment.
2. An initiating concept and input of resources to create a system.
3. A transformation whose outcome is a service intervention that affects the conditions in its surroundings.
4. A termination or restoration state of the environment, typically at system disposal or renewal.
5. Start and finish times of this lifetime of events.
6. Responsibility/accountability and resources for its execution.

In a community-type society where the real world is effectively accounted for, every stage in the life-cycle of a system under [societal] development and operation is considered simultaneously, when planning and executing the system life-cycle.

> **INSIGHT:** *Holistic approaches invariably bring in the need for some type of system life-cycle, project coordination so that every piece of data/ information is collected and traceable from design through manufacturing and possibly training.*

Though used synonymously herein, the terms stage and phase do not trace to the same ontological origin. Stage connotes the image of renewal of allocated resources that enable a system to run its course, as in predetermined staging points to continue a journey. This metaphor conveys an essential linear path of engineering and coordination without stopping points for decisions that lead to the decision to allocate new resources. Phase represents a distinguishable aspect or sector of a repetitively changing situation, as in the recurrence of phases of the moon. It is a feature of cyclic model forms, and as a metaphor, suggests reiteration of identical or similar situations.

5.2.1 Societal systems have life-cycles

> **NOTE:** *Like all living things, operable systems [with which humans interact] go through a life cycle. To understand the development of a habitat service system, and its place within the organization of society, knowledge of the life cycle of systems is necessary.*

The purpose of defining a system's life-cycle is to establish a framework for meeting the stakeholders' needs in an orderly and efficient manner. This is usually done by defining life cycle stages and using decision gates to determine readiness to move from one stage to the next. Life cycle phases provide organizations with a framework from which a coordinator (management) has high-level visibility and control of both the project and system. The system life-cycle is seen as an intersection of project management (the business case and funding) and the technical aspects, the product or suite of products crafted into a system. Life cycles vary according to the nature, purpose, use and prevailing circumstances of the system. Each stage has a distinct purpose and contribution to the whole life cycle and is conserved when planning and executing the system life cycle.

> **CLARIFICATION:** *Each state or threshold in the life of a system or project is defined by a checklist. A checklist to confirm whether or not the system is ready for integration; such a type of checklist is known as an, 'Acceptance criteria'.*

In application, there are many types of [project] life-cycle, the most popular ones are: phase to phase relationships, predictive life cycles, iterative and incremental life cycles and the adaptive life cycles. In other words, How are the following activities for engineering a system into existence being expressed (requirements : design : Implementation : Test : Close)? And, how are these activity sets expressed:

1. **In parallel** - simple sequential "phase-to-phase relationships.
2. **In series** - simple overlapping relationships.
3. **In incremental life cycle loops** - an adaptive life cycle.

> **CLARIFICATION:** *Product life-cycle and project life-cycle appear similar, but are different from each other in meaning. Project life cycle is the series of phases that a project passes through from its initiation to its closure. Service life-cycle are the series of phases that represent the evolution of a service, from concept through delivery, growth, maturity and to retirement Some services have products. Product lifecycle are the series of phases that represent the evolution of a product, from concept through delivery, growth, maturity and to retirement (PMI 2013).*

In every project there are layers of life-cycles:

1. **Product life cycle** – "A collection of generally sequential, non-overlapping product phases whose name and number are determined by the manufacturing and control needs of the organization. The last product life cycle phase for a product is generally the product's retirement. Generally, a project life-cycle is contained within one or more product life cycles" (ANSI and PMI

2008, 18).

   A. Engineering activities necessary to guide product development while ensuring that the product is properly designed to make it affordable to produce, own, operate, maintain, and eventually to dispose of, without undue risk to health or the environment" (IEEE Std 1220 2005). The cycle might include beginning, e.g. elicitation of stakeholder needs; middle, e.g. design or integration of components, and end, e.g. deployment or maintenance phases or stages.

2. **Project life cycle** - "A collection of generally sequential project phases whose name and number are determined by the control needs of the organization or organizations involved in the project" (ANSI and PMI 2008, 15).
   A. A project [life] cycle is the series of phases (a.k.a. process groups that a project passes through from its initiation to its closure.
3. **System life cycle** – "The evolution with time of a system-of-interest from conception through to retirement" (Haskins 2010).
   A. The system life cycle is composed of a set of interacting system elements, each of which can be implemented to fulfill its respective specified requirements. A system progresses through its life cycle as the result of actions, performed and managed by people in organizations, using processes for execution of these actions" (ISO/IEC/IEEE 15288 - Systems and Software Engineering: System Life Cycle Processes). The system of interest is composed of multiple products.

NOTE: *There is generally recognition that at least two information lifecycles exist for social creation: one for the social organizational level (values) and one for the technical organizational level (sciences).*

6 Design and production [control] method

A.k.a., Design and production [control] strategies.

"The extent to which you have a design style is the extent to which you have not solved the design problem." [In other words, by focusing on the need, a designer becomes capable of solving the actual design problem; design is a process and not a style.]
- Charles Eames

Three **production strategies (a.k.a., production methods)** are involved in the requirements specifications of all engineering solutions that pass through this inquiry. Each strategy represents a necessary element in the process of sustaining "strategic" access. A 'strategy' is a description of when and how a described *objective* (or *task*) will be completed. In community, we apply strategies to the design of engineering solutions as a means of preserving our natural habitat, which provides resources and services for the community's very continuity (i.e., it is a resource accounting system). Strategies are "vehicles" for moving information between the conceptualized problem space and the instantiation of a solution design space [via a layered modeling information set].

Together, these strategies represent a community survival mechanism. The three strategies are:

1. **Strategic preservation (strategic planning)** - maximize the preservation of our resources.
2. **Strategic safety (strategic operations and maintenance)** - minimize the damage to our environment.
3. **Strategic efficiency (strategic computation)** - maximize the efficient spatial and temporal design (i.e., each new/iterate design) of goods, services, and systems.

Together, these strategies are encoded into the three operational processes of the Habitat's subsystems. The Habitat systems maintain their strategic preservation by planning for the knowable resource consumption by needed goods, services, and systems. This planning process is known as *Strategic Planning and Preservation.* All systematic planning occurs in the context of the integration of new knowledge and understanding into the future design of the Habitat's systems; wherein newly coherent information is encoded into the systems that support in the service of individual fulfillment. Planning provides a determinable decision space for the maximum preservation of resources. The planning process is inter-coordinated with the *Maintenance and Operations* operational process, which seeks systems with longer usability and less maintenance. Strategic safety concerns the *Incident Response* operational process, which encodes the recognition that damage to systems must be identified, minimized, and recovered from for fulfillment to remain sustained. Strategic efficiency involves a common decision space for commonly (or collectively) arriving at new and increasingly efficient and sustainable solutions to common issues. Efficient systems talk, share, communicate, and cooperate. The community is one single, efficient system sharing a similar approach to life.

Every application of systems engineering at the scale of in production services involves three principally strategic perspectives:

1. Designing a functionally working and desirable system that will preserve its functioning as a useful tool. How do we design systems that are preservational in formal operation? This perspective might be equated with the notion of 'strategic preservation' and 'eco-logical viability'.
2. Designing-in 'prevention features' and safety mechanisms to prevent the thing from failing and/or injuring (even during normal use). How can we design this tool so that it is unlikely to fail and to injure? This perspective might be equated with the notion of 'strategic safety' and 'human desirability'.
3. Account for the effort expenditure required to maintain the operation and maintenance of the integrated structural system. How might we design this tool so that it is efficient in its total service operation, including replacement, interoperation, and its automation/manual potential? This perspective might be equated with 'strategic efficiency' and 'technical feasibility'.

In community, user access to habitats [as the 'unit' of a common configuration of resources] is designed (Read: decided) by an integrated, contributing and cooperating local-global inter-system team; who visualize all aspects of user access in order to plan fulfillment, together.

In order design an access systems (solutions, master-plans), the following concerns must be accounted for, at least:

1. Is the societal system sustainable into the future - for the fulfillment of the next generations?
2. Is user access (to resource compositions) excessive - takes over what is planned-user access (the flexible master-plan)?
3. Is the user (who is accessing resource compositions) in error in their usage - user error "is" or "is not" occurring. User error can occur at each of the three sections of access (personal, common, or team).

In order to maintain this three tiered approach, there are three associated design protocols that may be applied:

1. **Strategic preservation [planning]**
   A. *Protocols & Requirements:* Goods and services are designed to last, to remain effectively integrated, and to recycle optimally; designs have a [maximum] 'lifespan'. The maximization of the preservation of our resources occurs under the coordinated and planned condition of using a minimum amount of material for effective service design in a life-need space (longer usability & less maintenance). Good engineering uses the minimum amount of material for the maximum amount of strength [as an 'organism' must; biomimicry - how does nature solve this? When you don't know what to do, mimic nature]. Every good produced must be designed to last as long as strategically desired (i.e., maximum durability). The more things break down, the more resources a community is going to need to replace them and the more waste produced. A regenerative system is a zero "waste" system. Biomimicry is the essence of blending our technologies with our emergent understands of nature.

   If you know where you are going (e.g., function[al direction]), then *efficiency* and *aesthetics* are your improvement opportunities.

2. **Strategic safety [operations & maintenance]**
   A. *Protocols & Requirements:* Goods are designed to decompose in a timely manner or re-cycle (minimize pollution), and not present toxicological threats. A community is constantly on the lookout to minimize the damage to itself and its environmental habitat by designing increasingly safe-able systems. For instance, the design of a personal "home" dwelling on top of the water would be designed to be "nearly" unsinkable. A strategically safe orientation involves the application of a cradle-to-cradle design strategy (e.g., a strategic recycling conduciveness calculation), or as near to it as possible. When goods do break down or are no longer usable (for whatever reason) they must be recyclable to the greatest technological extent possible, or they must be decomposed within a timely manner. The design of service production systems must account for this directly, and at their earliest stages. Effectively, this requirement is necessary to balance "negative retro-actions", or environmentally damaging effects, that certain resources or their applications invariably have. Cradle-to-cradle design would ensure that all matter remains

in the metabolism of the planet - all material is designed to be recycled in some form.

Safety as an afterthought is not safe. The statement, “We will test [for safety] if we suspect a problem” is not a sufficiently safe [strategic] solution. For a system “to be safe”, it must be designed to be safe.

It is important to remember the value of the ‘**precautionary principle**’ when discussing strategic safety. The precautionary protocol (or “precautionary principle”/”cautionary principle”) states that there exists the onus of showing that a chemical or other structure is not harmful prior to its introduction into the habitat service system. This protocol is a form of strategic safety. Chemical substances, in particular, can affect our mind-body; they can affect our perception, our cognition, and our life experience, and that is what makes their introduction into the community (and ecology) is an intellectual freedom issue which works both ways - with ‘nutrition’ (that provides the strategic potential to facilitate life experience) and ‘pharmaceutical drugs’ (that provide the potential to strategically reduce life experience). It is unwise to ignore [potential] toxicants in the environment; they affect our living systems. Toxins affect our brains, and hence, our behaviors (and potentially even our expressed personality). Fundamentally, when the device that you are using to assess your behavior (i.e., your brain) is not working [or is in-toxic-ated], then you cannot accurately assess your behavior, and hence, cannot accurately re-orient, and may possibly be more highly reactionary.

3. **Strategic efficiency [computations]**
   A. *Protocols & Requirements:* Goods that evolve rapidly are designed to be updatable and modular. Quickly evolving technologies, such as electronics, which are subject to the fastest rates of technological obsolescence would be designed as much as possible to foreshadow and accommodate physical updates. The last thing we want to do as a community is throw away an entire computing system because it has one broken part or one part is outdated. So, components are designed to be easily updated, part-by-part, standardized, modular, compatible, and universally interchangeable, foreshadowed by the current trend of technological change. Essentially, this involves efficiency in how we iteratively modify our environment. Technological automation is a form of efficiency applied herein to free humankind from banal labor that we no longer find desirable.

The mechanisms of strategic preservation, strategic safety, and strategic efficiency are purely technical considerations devoid of human opinion or bias. Their protocols and requirements represent commonly informed constraints structured by the core components of a relational value system, and applied to the design of all solutions so that the next iterative state of the habitat remains in alignment with the community’s direction and purpose. Habitat service structures (which are designed to be responsive) are not based on preference, but on material and engineering sciences to create the most desirable quality structure technically feasible though the encoding of strategies by means of protocols. In a sense, these protocols feature our community’s comprehensive capability to sustain [a threshold of] fulfillment.

> **CLARIFICATION:** *Protocols filter design decisions. In specific, design decisions herein are filtered through a series of sustainability and efficiency design protocols that relate to not only the state of the natural world, but also the total habitat service system (as far as what is compatible).*

Protocols clarify how information is encoded and translationally define what is most important in the decisioning process. To remain in harmony with an abundance promoting ecological state there must exist, within the protocols, an awareness of wholeness that recognizes and respects all the different parts of an individual’s life [in a community and in an ecology = community + environment]. And still, protocols must allow for or facilitate adaptation and creative exploration (i.e., freedom). Protocols represent binding technical decisioning rules against potentially destructive consequences and interventions - they represent an informed and wise self-orientation.

Metaphysically speaking, consciousness intentionally orients itself in the direction of its chosen values. If something is valued by an entity, then that entity is likely to orient itself so that its decisions achieve its desired value condition, or at the least, greater approximations of the valued state. Logically, therefore, value must be consciously and transparently encoded into the service systems of a community by participating individuals; and to do this intelligently it must be formalized into a set of explicit engineering [transport] protocols. Importantly, these systems generate and reinforce value conditions, and hence, it is unwise to unconsciously create and use, and occult, designs service systems; doing so will tear apart a community through the generation of seemingly unresolvable conflict. Formalized protocols make value-oriented systems-level decisioning explicit to the community.

In the encoding of a social value system into the solutions that compose the technological structure of the habitat there exist three principle and systematically desirable conditions:

1. Maximize conditions representing alignment with our purpose and goals and values. This condition accounts for direction and orientation. There exists a map in the territory.
2. Maximize conditions representing the generation of a state of greater coherency in our value system (in its frequency of meeting needs). A value system must be integrated into a total information system if it is to remain in alignment with the discovery and verification of new information.
3. Minimize all conditions which may structurally generate conflict and contradiction in our approach. These are conditions that do not represent an alignment with our highest potential state of fulfillment.

When these conditions are maintained in the production of goods and service systems, then they could be said to meet their intended social requirements for common use and access. Here, the term integrity engineering is applied to describe the processes of 'quality assurance' and 'functional verification' of need fulfillment [through feedback]. The three bulleted conditions listed above are represented in the engineering process as three conceptual forms of integrity: material integrity (e.g., maximum product lifespan); structural and functional integrity (e.g., functional safety and safety by design); and habitat integrity (e.g., ecological equilibrium modulation). A usefully designed economy accounts for more than just the quantity of demand of a product or service, but the integrity and orientation of the service system as a whole in a larger and responsive environmental system.

> **INSIGHT:** *By comparing material designs, failures can be more easily predicted.*

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TABLES

Table 8. Decision System > Inquiry Solution*: Material element design attributes.*

Variable	Composition	Generator (Materializer)	Result
Dimensions	E.g., Length, volume, angle, etc.	Machine tool	*Statics* Assembly
Surface geometry	E.g., Texture, roundness, cylindricity, etc.	Manufacturing process	*Dynamics* Translation Rotation
Physical attributes	E.g., Hardness, residual stress, etc.	Material properties	*Endurance* Wear Fatigue

Need and Preference Inquiry Accounting

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Abstract

In the context of decisioning, conducting a preference survey serves as a vital cornerstone in the pursuit of creating products that are used by expected users. At the heart of this survey lies the commitment to not only understand user preferences but also to incorporate these preferences into the production process. By actively seeking and valuing user input, the decision system remains a user-centric approach that ensures our products align closely with the desires and expectations of those who will ultimately benefit from them. This commitment to gathering and acting upon user preferences not only enhances product access quality, but also fosters a stronger connection between the contributors and the end-users, fostering a sense of collaboration and mutual understanding that is invaluable.

Graphical Abstract

Image Not Yet Associated

1 Need and preference accounting and inquiry

INSIGHT: *Simply, the system is designed to meet as many issued needs and wants as possible given what the design of the system [by capacity], and the availability of resources, will allow - to produce abundance and meet the populations needs (with redundancy) through a cooperative model.*

Demand is a multi-layered conception:

1. Demand is what the user needs. What does the user need (what are the user's requirements)?
2. Demand is what capacity is present. What resources are available, or could be made available to complete the demand?
3. Demand is what production is present. What production (and how much) must occur to meet the given demand?
   A. How should that production be configured to meet the demand?

Information about demand is collected from the population in the following ways:

1. Surveys:
   A. Of people.
   B. Of resources.
2. Interviews.
   A. With people.
3. Stock monitoring.
   A. Of products.
4. GPS tracking.
   A. Of products

Demand in community is composed of needs and preferences, and issues concerning needs and preferences. In concern to decisioning and planning, needs are separated from preferences, and both are motivations/desires:

1. **Need** is a concept representing a real-world relationship between an individual human organism and its psycho-socio and material environment, wherein the organism requires their fulfillment in order to have survival and total well-being. Needs can be categorized, and all human beings have a common set of needs. A need is a category of production, the productions for survival through flourishing requirements spectrum. Needs are requirements that an organism(s) experience as feelings, intrinsic drives and motivations for well-being. Each need involves human thoughts and behaviors, which are expressive of object acquisition and/or environmental reconfiguration.
   A. At the population level, common needs have parameters, generally forming a bell shaped curve (e.g., shoe sizes, protein per day, etc.).
2. **Preference** is a concept representing an individual's decision about:
   A. The subjective-internal desire-needs of the body and mind (e.g., an apple versus a grape, wine versus vodka, pork versus cow; or soccer versus basketball; etc.).
   B. The aesthetic-type desire-needs as characteristic of the producible product (e.g., color of tile, color of phone case, decorative elements in any environment, etc.). Preferences can be categorized, and all human beings (given human needs and context specificity) have a common set of preferences.
   C. At the population level, preferences have surface differences, such as decorative, cosmetic, and service-object sub-selection (such as living in a habitat, or habitat region, where pork meat is available, or golf is available, which for both, may not be all habitats in the global habitat service network).

CLARIFICATION: *In community, there are objective and common needs, and therein, categories of preference. In the market, there are wants, which are "consumer" preferences.*

1.1 The actual need of any issue

The actual need for any issue in this decision system is some complex combination of socio-technical human need factors bound up within the material context of a habitat [support service] system that operates at a global network-level where resources are shared, as well as a local habitat service system level where individuals lead community-customized lifestyles. Hence, the result of a societal [economic] decision system completing issues is:

1. An adapt[-ve/-ed] master-plan (and executed socio-technical operation) for a master planned human need socio-technical habitat fulfillment system.
2. Fulfillment for every single-individual in the global habitat.

The global habitat-ecology provides resources and human contribution for every local habitat, where community residents reside and have (personal, commons, and contributions) access to global-local habitat support services.

1.2 Preferences

After need comes preference. It is important to first understand that in a community-type society, humans have needs, and preferences therein. In concern to comprehensive planning, users of habitat services have a variety of things that they need and prefer. Here, planning is first done in terms of broader categories, the needs. For example, the plan has to come up for a plan for shoes, and then, there are preferences therein. The comprehensive planning is done in terms of broader categories of goods and services (e.g., life support footwear, etc.). In centrally planned economies of the past, consumers were disenfranchised (ignored and not taken into account). Community accounts for user's preferences. The user's needs, and preferences therein, must be accounted for in the process of deciding what is being (and, will be) done. Solving big matrices is feasible with computers in the early 21st century. When planning isn't done comprehensively and transparently at the global level, then some people's subjective preferences can reorder things outside of what "my or your" subjective preference actually would be.

> **INSIGHT:** *We are different in what we like, but what we need is the same.*

Individuals have preferences when it comes to need fulfillment, which are identifiable and accounted for. Demand has two principal representations in this system, and one of those representations is the Preference Inquiry process (the other is the issue articulation process). Preference Inquiry is, among other things, a form of demand surveying and demand analysis. A demand survey is one mechanism for identifying use-value needs. In other words, this inquiry process uses continual surveys of demand in order to identify community needs and wants, and the preferences therein. Conversely, a market system uses price and money. In community, we ask ourselves what we need from an environment, and we intentionally re-design to meet that fulfillment. In community, the realized system provides enough well-being that people's experience of the inequality is reduced to a [rationally] tolerable level.

In its most fundamental form, Preference Inquiry is the process of accounting for the individual demand for service functionality from the habitat service system for any given user [in time-space]. Some design specifications will involve preferences, and others will not. But, the idea of a 'preference' is larger than just an account for 'functionality' at a population level. Individuals in a community have identifiable and relational preferences as to how their needs and wants are met. The notion of 'preference' signifies the importance that what works for others might not work for "me". Although the need of food and water is very much objective, some individuals in the community might prefer eating different foods or consuming different beverages than others. Hence, the system is designed to account for these "subjective" or "individualized" preferences, which are rooted in needs and wants, and can be continuously surveyed.

All humans have objective needs, but how those needs are pursued is [in part] based upon conditions and conditioning (i.e., culture). Conditions and conditioning influence how individuals orient their decisions toward actions that we take to meet needs. Entrance into this community is based in-part on the value orientation that someone holds, both toward themselves and toward others. Here, it is possible to realize that a value orientation toward fulfillment is a 'structure', and so, also, is a value orientation away from it. But, we also realize, that if the Community is to remain stable, then it must remain composed of individuals with a measurable threshold of alignment with a common purpose (trajectory). In other words, we must be in orientational resonance to resonate at the higher potential that we know is possible, and that we find intentionally desirable. In practical terms, this means that a screening process will be necessary, at first, for initial "agreed acceptance" into the Community. In community there are some preferences that we all share, and it is important for us to remain coherent as we scale (and become more resilient to initially corrosive value orientations). Hence, the Preference Inquiry process necessitates a value screening process for inclusion into the community; at least, in its initial phases of forming [into existence]. And, once in community, then value-reorientation becomes a restorative process and not a retributive one.

A preference is defined herein as a greater subjective liking for one perceptual aesthetic design, and/or sub-object category type alternative, over another or others. A preference is an aesthetic value, whose objective value cannot be verified or derived, and is currently unable to be scientifically measured; though it may be measured between by relationally subjective input (i.e., the input of our preferences). In other words, "preference inquiry" refers to the surveying of the preferences of the community as it concerns the potentially variable [by individual] attributes of a solution, which is fully accounted for. It accounts for the perceptual aesthetics and sub-object type differences (e.g., apple versus banana) of a demanded functional good or service. Community surveying accounts for the existence of preferences and provides an "objective" (by "subjective"; like "price") measure of preference, as well as the degree of difference between preferences (statistics), which may be more deeply inquired into.

A preference must be capable of being expressed and described such that its resource requirements and production costs may be known, otherwise there is not yet a preference, but simply an idea. If action cannot be taken, then strategy cannot be applied. Without meaning, which creates preference, there is no powered directive (or intentional attractor) in a task.

We know scientifically that the preferences of humans are sensitive to context and calculated at the time of choice. (Warren, 2010) To maintain a context that aligns to the real world the output of every other inquiry process is transparently available to those surveying themselves (i.e., to the community) so that they are capable of making a preference selection with at least the maximum amount of system information available at the time of preference (i.e., an accurate perceived contextual environment), which might also be said for issue articulation in general. Fundamentally, when individuals among society understand what they have to work with, including their resources and common demands, then they are less likely to demand impulsively.

The clothing service, for instance, does not need each potential consumer in a population of tens or hundreds of millions to state their expected production requirements for the coming year. The service could begin the year by producing shoes, for instance, in the varieties expected to meet previous patterns of demand, in conjunction with user surveys and intelligence analysis. As actual demand for different products become clearer, production units will adjust what they produce. It is also possible to make shoes, and all clothes, on demand.

In this way, consumption choices are monitored ex post and production units respond to that feedback by adjusting their ex ante plans for how much to produce in the next immediate period. Products that are not selected for consumption by citizens are either produced in smaller quantities or, if demand is exceptionally low, discontinued altogether. Clothing, like many other products, could be produced in trial batch runs and production ramped up if consumers prove to like them.

> **INSIGHT:** *In community, the production and stocking of products is demanded by the consumer and predicted with intelligence by the produce, rather than pushed by a company for profit.*

Flexing production services (preferences) are facilitated by the ubiquity of information, including universal product bar codes, user surveys, collaborative design software, artificial intelligence, automated on-demand fabrication, and the internet. Open information about what all economic units have produced, their consumption rates, and their plans for the future overcomes the fragmentation of decision-making that is the key feature of economies that don't effectively account for personal preferences.

2 The need inquiry

A.k.a., The human needs list, the directions list, the human need for objects and socio-technical conditions.

The system must account for, visualize, and calculated for all human needs and life-phase, using a human needs list and accompanying set of life-related models. As part of the residentation of any user, there is a resident user profile, including agreements (for residency, common activities, and contribution) and a surveying program to allow users to identify and select their needs, preferences, and habitat of choice. User profiles exist within a global, coordinated societal project information system. User needs and preferences are common information in the form of continuous issues [requiring solutions] within a[n economic] decision system. Note that the needs list is sometimes called a "General Catalogue". Note that in a market, there are prices associated with the items on this list.

The need inquiry process requires:

1. A standards formalized list of human needs is required (cycles of requirement).
   A. A survey of user's life-phase
   B. A survey of common [objective] needs.
   C. A survey of individuals' fulfilment of common needs. Each need is recognized by users (and contributors) and the user (and contributor) signify how "OK" (well, happy) they are with the support service's operation in facilitating having the need met (including the need for contribution).
2. A standards formalized list of objectives (that form actions taken to meet needs) is required.
   A. A survey of common objectives.
   B. A survey of applied objectives. Each objective is recognized by contributors (and users) and the contributors (and users) measure its progress and impact (defined metrics), allowing for a quantifiable assessment of its achievement and relevance within the project or system.
3. Personal preference accounting, within the context of human needs and common heritage resources.
   A. The potential for a preference is recognized by contributors, whereupon users are provided with choices, within which they indicate their preferences, which become a part of their user (public- and private-economic access) profile.
   B. Production has variety, and users take from the warehouse the version they want (of the different variety), and production is flexibly adapted to meet their preference (daily, weekly, monthly, seasonally, yearly).

4. An organizational formalized [project] list of contributors, some of whom coordinate projects that use societal resources (informational and material resources).
   A. A societal resource using project survey.
   B. A societal coordinator using project survey (i.e., who decides/approves in the organization).
5. An organizational formalized [project] list of resources, some of which are people, skills, informational (concepts), and material (objects).
   A. A global survey of resources.

3 The preference inquiry

A.k.a., The preference list, the subjective needs inquiry, the objectives list, the orienting inquiry, the objectives when completing fulfillment.

Preferences in solution are inquired into so that users have then appropriately met. Note that the preference availability list is sometimes called the "Specifics Catalogue". Note that in a market, there are prices associated with the items on this list.

Preference is typically acquired through surveys (of the users themselves). In community, there are at least the following preference surveys that must be used and maintained for all individual users who have preferences:

1. Habitat residency agreement preference surveys - show the completed habitat agreements for any individual.
2. Habitat services preference surveys - show the completed technologies (service-objects) preferences.
   A. Show habitat service production preference (typically, technology level of choice and exploratory activities of choice).
      1. Show cyclical master-plan sub-service production preferences.
      2. Show ongoing (continuous) scheduling preferences.
   B. Show habitat sub-service production preferences for objects.
      1. Show cyclical master-plan sub-service production preferences.
      2. Show ongoing (continuous) production preferences (i.e., dynamic production customization based on continuous surveying and observed changes in demand).
3. Habitat customization preference surveys.
   A. Show reasoning and decisioning for the master-plan aesthetic choice set.
   B. Show habitat master-plan aesthetic preferences (leads to a consensus vote).
4. Contribution objectives [preference] surveys. Here, the preference is for community objectives.
   A. Show (in contribution performance reviews) how the contributors met needs and (community-type) objectives (as stated in the Project's lists).

Given needs and preferences, a decision system ought to:

1. Give users (in society) the ability to customize, in terms of habitat location residency, habitat dwelling residency, and personal object-services.
2. Require the accounting of needs, preferences, and

all resources therein.

3. Not design any system for execution (operation) that the users do not prefer to use.
4. Design a system so that users can customize their:
   A. Personal-access objects (given system constraints).
   B. Personal dwelling (given system constraints).
   C. Personal residency (at some residency zoned location).

The preference inquiry process asks:

1. Identify the ‘perceptual preference’ qualities of a good, service or system? This includes, but is not necessarily limited to: color preferences; color harmony; the quantitative use of colors; composition; orientation; balance; shape and form.
2. How many people want the good or service, in how many different ways, and what are the production costs of each?
3. Is mass customization/individualization/ modularization possible? The ultimate expression of freedom in the domain of technology is the freedom of mass aesthetic and personal customization, which is facilitated through modularization and digital fabrication from “your” data (e.g., 3D printing based on measurements of “your” unique body). This is a condition that a host of technologies, such as 3D printing, FDM, additive manufacturing (additive engineering), extrusion manufacturing, and contour crafting are quickly allowing.
4. Is this a ‘personal access’ item (e.g., goes inside of your home; is intimately connected to your body)?
5. If mass customization is not possible then is partial customization possible? Such as, there existing a finite series of different aesthetic designs for the case of a smart phone.
6. Is the preference design attribute being surveyed in any way an element of the functional design of the product or service?
7. Does the perceptual design attribute serve a function for which closer degrees of technical optimization are possible? For example, the characteristics of an emergency door on a building.
8. Are there any knowable cause and effect relationships between this preference attribute and a larger system, or environment, of which it is a part? For example, the color of a building might impact the behavior of bird species in the area, or even our sense of connection as we walk by it. Alternatively, the placement of a tennis court might impact the placement of other habitat services.
9. Is the agreed threshold of preference diversion on an issues resolution?
10. Is the design preference part of a larger infrastructure design decision? For example, the placement of a new architectural building in the community. In other words, at what scale do you visualize your preference emerging at the cost of the preferences of others (given that we all have a similar value orientation)? Can we “achieve” a common preference on those things that it is preferential to have a common preference?

There are protocols that control for personal preference. These protocols are part of the decision resolution system, and are classified under preference inquires [by users] of the decision system.

3.1 Residency need-preference

In community, there are different types of buildings that people can reside in. Higher density dwelling-type buildings have floors above one another. In community, the need is for high-quality architectural service support productions. Service quality means sufficient fulfillment of architectural requirements by teams for users. Herein, people are given additional choice, because they have preferences for where they want to live in terms of [at least]:

1. Single family dwelling.
2. Multi-family dwelling (small-to-mid size dwelling building).
3. Multi-floor family dwelling (a.k.a., apartment).
4. Number of floors.
5. Density of building and surrounding habitat.
6. Dimensional size of dwelling space.
7. Precise floor dwelling level.
8. Habitat locational coordinates on planet and in local habitat (what positional distance).
9. Locational quality (what socio-technical region of the planet).
10. Accessibility.
11. Likelihood of disturbing or being disturbed by others.

In community, people have the choice of where to live, because people naturally have preferences for where they want to live in terms of [at least]:

1. Density of human population.
2. Degree of urbanality / rurality.
3. Service and service-object availability.
4. Dimensional size of dwelling space.
5. Floor level.
6. Aesthetics.
7. Total habitat service accessibility.
8. Climate and biosphere; locational coordinates on planet.
9. Level of technological integration and intelligent

automation.

10. Privacy and likelihood of disturbing, or being disturbed by, others.
11. Etc.

How to live is a need, where to live is a preference. Humans have a need for shelter, which must be met somehow. What is not a preference is having an optimized dwelling (home shelter) in concern to:

1. Resource life-cycling and resource sustainability of the building *for occupants* (an enclosure with resource life-cycle accounting).
2. Life-expectancy of the building *for occupants* (an enclosure of an expected duration).
3. Functionality of the building *for occupants* (an enclosure of an expected operation).
4. Maintenance of the building *for occupants* (an optimized low-labor enclosure).
5. Mitigating potential risks to the building and occupants (an optimal enclosure for a given geographic area).

In the case of a personal preference for dwelling, the issue of floor choice (i.e., which level of an apartment) may arise, because population density leads to the stacking of floors [of populations] in order to provide higher density. Hence, the following events could occur:

1. In some cases, the ground floor or lower level floors are mostly commonly accessible on a disability scale. Wherein, the lower level floors, or lowest floor, is dedicated to those for whom it would be more difficult to access higher level floors, and therefore prefer lower level floors. In concern to the protocol, the protocol may be that some building with some given identifier is populated on the lowest (or, lower floors) only by those with significant mobility disability; and those with disabilities may not reside in the higher floors.
2. In some cases, the ground floor (or, lower level floors) are only accessible to those with pets whose movement is likely to make noise. The protocol may be that those persons with pets may only reside on the lowest (or, lower) floors; and, they may not reside on the higher floors. They may not reside on the higher floors because as people move higher they become above others, they produce noise pollution, which is controlled in the building.
3. In some cases, when a dwelling becomes open for occupation, it is given out randomly to a pool of persons who have selected that occupancy as their next location.
4. It is also possible to restrict the pool so that specific sizes of dwelling units (e.g., 2,3,4 bedroom) go to pools of family priority, then friend priority sizes of persons who prefer to live with one another. For example, size 3 bedroom dwelling units go to a priority pool of persons made up of 3 persons (or, bedroom's of persons).
5. In some cases, the ground floor (or, other specific floors) are only occupiable for visitors staying less than 2 months.
6. In some cases, the ground floors (one or more floors) are not occupiable as a residency, and are used for other purposes.
7. In some cases, the upper floors (one of more floors) are not occupiable as a residency, and are used for other purposes.
8. Not everyone will prefer every location. Some persons will not want a larger space to clean. Some people will prefer lower floors, and some people higher floors. People analyze their own needs and options, and community seeks to optimize the fulfillment of their needs.

3.2 Aesthetic preference

That which is of aesthetic value has relative uniqueness to the individual, and categorically uniqueness to a culture; although, there are some common environments that are considered universally aesthetic*:* scenes of nature, for example, and harmoniously looking bio-mimetic shapes. It may then be wise to mimic these universally aesthetic scenes in our own, infrastructural environments. We can plan beauty and a sense of connection into our community service environments; we can also [by degree] plan flexibility into our spaces. And, we can measure our responses to the environments we create and adjust our preferences accordingly.

Ask yourself, if there are any principles which may universally describe an aesthetic environment, and whether these principles (if they exist) should be applied to the construction of our common spaces (i.e., not ‘personal space’)? Here, non-customizable, community access preferences are part, or become part, of the larger strategic integration plan of the community; they are fixtures (i.e., fixed), and hence, their aesthetic design must be integrated.

There can exist technically functional design “optimization” in a temporal sense given adequate access to resources and design alignment with the most currently understood scientific-engineering principles. As long as our knowledge continues to grow and evolve, so too would our definition of the “perfection” of a functional design. Yet, there is no perfect vision in community; there is only the emergent state up till now, which has been participatively and iteratively designed. Among community there is no system, nor person, to dictate the “preferred” structure of society to the rest of the community. The belief in authority would appear as one source for the modern dis-ordered mental state known as “perfectionism”.

Some might argue that the human psyche (or mind) is most capable of entering “peak states of being” and “states of flow” under specifically identifiable, perceptual environmental conditions (under structures that signal in a certain way). And so, we ask ourselves, what perceptual conditions make us feel greater love, more connectedness, a sense of being at peace with ourselves and our world? Can we identify or approximate in our physical architectural designs these perceptual conditions? Should we design our perceptual community to evoke the emotional state of a sense of well-being, while also facilitating socialization and material fulfillment? Are there certain aesthetic environmental designs or arrangements that continuously support in maintaining a heightened sense of well-being and fulfilling interactions?

Do not confuse "perceptual preference" opinions with "functional requirements" Someone who doesn’t play the game of tennis may have perceptual preferences of the arrangement of lines on the court or the color of the net and its height. Their perceptual preferences, however, are irrelevant because these are not preferentially aesthetic elements of a tennis court as an economic product, a sporting game, or a habitat service. Instead, they are known functional design elements in a tennis court. Their permanent modification by individual preference would interfere with the functional integrity of the tennis court (or, the “game of tennis”). That said, a more technologically advanced tennis court might give its users selectivity over the color of the lines, their space, and the height of the net if the users desire the preferential functional variability of these elements, and the technology allows for it. Technology allows for flexibility in space, such as “gaming spatial area” that can be re-configured to meet the dynamic gaming needs of individuals in that spatially boundaried area.

In community, a tennis court placed somewhere in the community becomes a ’in-production service’. Upon integrated production, a tennis court in the Community would literally becomes a stationary part of the Facility > Recreational subsystem with an associated “community access” tag as well as a dynamic availability tag; and, its physical space will have a categorical flexibility tag (e.g., can the space occupied by the current tennis court be reconfigured into another activity space that is of that category, but differentiated, like a ping-pong court or racket ball court). Its placement in the physical space of the habitat has an impact on the placement of many other physical services, and layers of technological infrastructure. Thus, the placement of the tennis court is not a preference decision, but a functional decision for a larger and strategically planned habitat service system, with built-in preference flexibility. Essentially, new physical services that acquire a permanent physical placement must be strategically designed to integrate into the efficient functional nature of the habitat and the general aesthetic design of the community.

Permanent physical structures in the community must be designed in a strategically planned manner (and operated so forth) if the conditions of efficiency, aesthetics, and equitable access are to carry forward as characteristics of the future state of the physical community. Many of towns and cities in early 21st century society have developed “organically” - without functional consideration. This impacts the efficiency of their systems, and therefore, the lives of their populations, and ultimately, their values and their freedom.

It is likely that a individual that perceive everything as unowned, and values cooperation toward a purpose, will be more flexible in concern to the aesthetic design decisions of a fixed ‘community access’ nature, than an individual who perceives everything as ownable and values the ability to “mark” one’s territory through personalization (often with contempt for another’s personalization in the process) or defacement. The selfish behaviors of some persons, where everyone takes possession of everything they can, prevents the fruition of an environment where individuals work for their own and everyone else’s betterment - the common betterment of everyone. Under conditions of self-destructive selfishness it is impossible to coordinate the use of natural resources for the sake of future generations or to commonly agree on an aesthetic decision, because [to a large degree] a “selfish person” cannot give up anything for someone else (i.e., they remain attached). Choice can be determined by one’s feeling of responsibility to something of a greater importance than the self.

> **INSIGHT:** *Some things are of a greater preference, and some things have no preference. There are constraints to preferences in any society. And, a society with a common value orientation will recognize a common set of constraints (or, directionally constraining strategies).*

3.3 Production preference

Individuals will have preferences (a.k.a., preferentially relevant requirements) for some habitat service productions, which must be accounted for when master-planning. For instance, since thermal comfort is inherently subjective, and strongly varies between people, it is important to give a high- and relative-degree of control to individuals, which can be materialized:

1. within the infrastructure of some master architectural dwelling and/or building plan (e.g., access to operable windows, shades, and an air conditioner/heat-pump system), or
2. mechanically (e.g., access to localized and energy-efficient fans or heaters, and thermostat controls).

The intent is for the user to be able to control [thermal, and other appropriate production preferential] conditions, either by using individual controls, or allowing occupants access to variable ambient conditions within a space; given, this excludes larger common and open spaces that have imposed environmental conditions for providing for individual preference of thermal (or other) condition; such as,

1. within the confines of an airplane where people do have some system parameterized ability to change the local temperature,
2. to a stadium, where atmospherics are controlled by a larger architectural HVAC system that may or may interface with the open sky-climate).

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Access Inquiry Accounting

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Abstract

All socio-technical platforms must account for access from both the side of the contributor and the side of the user. When doing anything related to contribution service work, there must be an accounting; when accessing user items and services, there must be an accounting. Labor is one necessary element for which to account when planning a project and operationalizing a product demanded by a user.

The global solution inquiry process maintains an planning system designed to optimize access coordination (a.k.a., access management) for contributors and users within a globally unified collaborative platforms. The access inquiry phase comprehensively accounts for and coordinates the intricacies of access, inclusive of types, permissions, and utilization of contributed labor and products. By focusing on the dual aspects of contribution and consumption, the system facilitates a seamless, transparent, and controlled environment for the human population (i.e., global human stakeholders). This access inquiry provides sufficient information to fully account for contributor access and access by a user to the products of contribution.

Graphical Abstract

Image Not Yet Associated

1 Access accounting and inquiry

The access accounting and inquiry (justice inquiry) process exists to identify **equitably feasible** solutions to the resolution of issues by applying a 'distributive justice strategy' to the proposed production of the design specification. The essential purpose of this process is to maintain **Equitable access** [fulfillment] to all common heritage resources. Distributive justice is defined as the socially just and equitably distributed (or coordinated) arrangement of [common heritage] resources toward the fulfillment of needs that involve material goods and services – and we recognize its benefits to society. Material equality is measured by the separation between what any two persons can access and participate in. In community, there is the planning of access to habitat productions will necessarily.

The access accounting and inquiry process is primarily an analysis and intelligence (and statistical services) process. Here, access is designed, programmed, observed, recognized, and adapted. Needs and preferences on the user-end become services for access on the contribution-end. In other words, needs and preferences are met through the work of contributors, who produce services and goods for access by users. There are only two/three stakeholders in the real-world, who are together as community stakeholders; the stakeholders are: Users, contributors, the earth. Note that in the market-State, stakeholdership is always complex and convoluted, because property and ideology make it so. In community, it simplex; there are three stakeholders, who are one.

The access/justice inquiry process ensures that resources are distributed in such a manner that the value[d] condition of 'equitable access' is maintained throughout the entire community (or multiple spatially separated cities). In the primacy of achieving this, the expressible quantity and quality of every system, good or service, must be accounted for, otherwise equity in access cannot be accounted for.

The access/justice inquiry process also acts as a mechanism to prevent the appropriation of resources by private persons. In an open and free community resources are not 'appropriated' by private persons, which is a structural design element.

Justice in all of its forms can only exist within the coordinates of equality – for without equality, all forms of justice will be applied differently to those of different status, class, power, wealth, and influence. Power structures form naturally when resources are distributed unequally. A distributively unjust socio-economic system will have the characteristics of a coercive and violent (or "forceful") system because the unequal distribution of resources (or "material wealth") will lead many of those with greater wealth to seek its preservation through manipulative or coercive means - they seek their own natural preservation in a competitive system (or the preservation of just their "family", their "business", their "industry", their "creed and colour") ... at the expense of greater fulfillment through synergistic coordination.

There are inherent behavioral and social consequences to any economic system that allows, or even worse, promotes, the privatization of resources, and thus, the formation of hierarchical power structures. Manipulation and coercion are a natural consequence of a human's intrinsic desire for self-preservation under any socio-economic system's condition wherein self-preservation is tied [immediately and strategically] to resources and resource acquisition in competition for survival. Here, we ask ourselves, Do we live in a society where we vote to participate in a political destiny, a "democracy". What is a "political destiny"? If a people surrender their consciousness, their independence and sense of what is right and what is wrong, then perhaps without knowing they become passive and controlled, unable to defend themselves and those they love; they become lost in "repeat mode" unable to develop [new structures]; they may never have learned how.

Any socio-economic system wherein justice is found through judgment is a system that limits the self-directed freedom of the individual through the restriction of individual liberties; judgment reduces the coordinated ability to effectively maintain a state of higher potential fulfillment. The term 'judgment' is defined herein as the forming of an opinion, estimate, notion, or conclusion, as from circumstances presented to the mind and articulated through the construct of an authority (Read: a power authority). Here, "liberty" is the state in which a person is not subject to coercion by the arbitrary will of another or others, and it is intimately linked with an individual's volition (or will) and ability form scientific, critical, and systematic thought [processing structures]. Thus, freedom is the environmentally influenced ability to direct one's own life and learning, and the opportunity to have learning experiences that improve our decisioning capabilities and construct decision space of a higher potential. But, this 'liberty' is not the absolute liberty to do as one pleases at the expense of others. Rather, it is the realization of responsibility through the integration of conscience in one's relationships and behaviors with others through self-integration.

If one person or group has the socioeconomic power or authority to judge another's life, then equitable access to resources does not exist (and there is likely some appropriation of resources by private ownership). Judgment is a form of discrimination and occurs prior to a full understanding of the root cause of a behavior, prior to systematically compassionate presence/understanding. Without compassion there is not community. Without compassion there are irrational, contradictory beliefs that are passed down generation after generation on the nature of the legitimacy of authority and the rationality of scaled cooperation; do you still hold any? Are "you" so used to living in a state of contradiction that "you" don't notice it? Judgment occurs prior to our common ability to comprehensively inform our decisions through parallel inquiry [into the capacitive abilities of our designs] and structured discovery.

Humans will quite normatively and naturally seek the preservation and continuation of the means by which their needs are being met. Within a socially unjust system those individuals and groups with “wealth” will quite naturally seek to maintain those systems that provide for their continued “wealth”. Self-preservation becomes tragic when a socio-economic system does not recognize one community with common [life support] needs and [social & recreational (quality-of-life)] wants. When a system is structured in such a way that some individuals’ needs are met at the expense of other individuals’ needs, then it is not a compassionate or wealthy system. A distributive justice strategy accounts for the “spectrum of preservation needs” – from life support to technological support to social & recreational needs, which are of a spatial-temporal (i.e., logistically strategic) frequent nature.

This decisioning space structured in such way that everyone’s core support needs are met and the sentient population uses its abundance of resources to pursue its higher potentials, wherever they may lead. Anything less than this is a system that simply does not go far enough in ensuring equal access to all resources, and it is likely to generate and reinforce corrosive social values.

Under conditions of privatization and material inequality individuals can be said to be only as free as their “purchasing power” allows them. As a community, we need access to goods and services, not private ownership of goods and services. Private ownership cannot lead to equitable access because its social consequences include the establishment of power structures that inherently prevent the expression of equal access, while generating the formation of human hierarchy. Consequently, wherever the community’s data, resources, and categorical goods and services are concerned, no separation exists between what any two persons can access (with safety qualifications) - this composes the idea of **strategic access**.

The Justice Inquiry process exists to identify the feasibility/viability of a design in effectively fulfilling, or optimizing the fulfillment of, human needs with the understanding that: the structure of a system dictates its potential capacity to effectively fulfill known needs; and, the strategies that we encode through the use of tools determine what we produce (and whether or not it is selectively adaptive to our highest intentions).

1.1 Use value

Goods and services are technological economic products and they have a **use value**. What does the term, ‘use value’, mean? Tools, mechanisms, and technologies are used to meet needs; these things have an expressible function and an -ability to orient a construction (i.e., strategy can be applied in their production and use) in a direction of intention. The value [of the use of an ‘object’] lies in the meeting of a need, which is an intentionally fulfilling emergence of direction. The value does not lie in the technology because the technology is simply an emergent means to an end, wherein the end is the meeting of a need. Over time, some needs will stay the same and other needs will fluctuate. Here, fluctuations can be traced, and ‘use values’ adjusted accordingly in relationship to production [efficiency].

Technology is constantly adapting and evolving due to advances in knowledge and understanding, and thus, will continuously meet all needs in novel ways. The value does not lie in the technology itself; instead, the value lies in how efficiently and effectively the technology meets an identifiable need, the functional use for the good or service. A house, for example, has a ‘use value’. It is first and foremost a place of shelter; sheltering from environmental exposure is a human life support need. It is also a place for restoration and contemplation. A house is a place where people can have privacy, and if they so choose, may “build a home” for themselves. A house has multiple ‘use values’, which are known broadly in every given society.

Goods and services are only as useful as the need they fulfill – some needs are functional and others are perceptually aesthetic. It is important to remember that interpersonal needs are not satisfied through technology, but through a value-oriented physically-

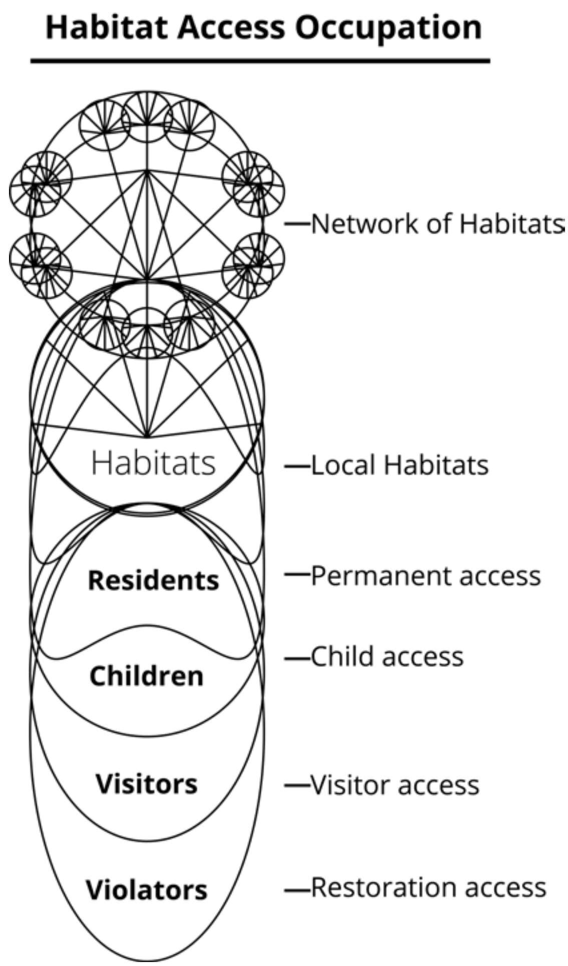

Figure 29. *The four forms of habitat access occupation.*

interpersonal relationship. Essentially, use values can be divided into those goods and services that are necessary for the bio-physio-techno support of a society, and those goods and services that serve social and recreational, quality-of-life, needs.

A community that recognizes the importance of equitable access must also recognize the primacy of use value in the structured prioritization of access. This is because 'use value' has a primary relationship to the real world – the world where humans have a spectrum of needs that must be met for the continuation of our life, our health, and our higher fulfillment. This decision system is structured in such a manner that goods and services are produced for their 'use value' and not their data-deficient 'exchange value'. Please note that this does not mean that exchange will not or cannot occur between individuals in the community.

2 Access profile

Each individual in a community-type society has a personal profile with two primary profile domains (two categories of access):

1. Common personal-user profile:
   A. Habitat agreements profile.
   B. Life-phase.
   C. Needs survey profile.
      1. Preferences survey profile.
   D. Community access profile.
      1. Personal access service-objects.
      2. Common access service-objects.
2. InterSystem team-contributor profile (i.e., work profile, resume, curriculum vitae):
   A. Socio-technical qualifications.
   B. Job history (a.k.a., work history, role history).
   C. Current contributing job/role.

Every user has a digital identifier that distinguishes every individual user, even those who share the same name. Every user may only have one unified profile. The access process in community is fully transparent and visible to everyone. It is expected that everyone maintains a truthful access profile under their real identity. Since everyone is able to see the everyone else's access items, everyone is able to make up their own mind about distributive justice of the access process. Open identities improve the efficiency of processing production information by encouraging users to be more contentious and intelligent in their access of community systems.

2.1 Profile access data

Objects and services that have been produced through the effort of contribution are accessed by users [in a societal system]. Users access these services (and objects) through a common software personal-access profile (interface). This profile records and categorizes, and may, anonymize some data, about all personal access, so that it is transparent to decisioning.

When any individual accesses any socio-technical service (or assembly) in a community habitat, they are doing so during one of the "phases" of their life-time:

1. Nurturing
2. Education.
3. Contribution.
4. Leisure.

In community, there are users, who are also contributors, forming three forms of access:

1. User access taking the forms:
   A. Personal access.

    B. Common access.
2. Contribution access, taking the form of coordinated InterSystem team access.

Wherein, the InterSystem team is composed of:

1. People (assemblies of humans), projects (assemblies of tasks) for society (people as "means of production").
    A. People doing work with complexes of other people, information, and machines.
2. Technologies (assemblies of resources) that reproduce society (at the community-scale).
    A. Socio-technical machine complexes (machines as "means of production") doing work to produce human need fulfillment services among a global network of community habitats.

3 Product awareness

Product awareness is all about the first time someone encounters something and sees it as possible to have access to (in the market, possess and own; in community, have access to).

It is important to identify when does a users first becomes aware of:

1. **A products existence** - what products exist?
2. **A products availability [to users]** - what specific product can "I" actually get access to?

> **QUESTION:** *When is the first time "you" encountered some product and saw that it as possible for "you" to have, or if not "you", then someone with either: 1) a sufficient amount of purchasing power (market only), or 2) of sufficient age and/or life-phase (State/ community)?*

People are likely to become aware of any given product's existences differently in different types of society (Read: When does someone first become aware of a product's existence?):

1. In community, users may first become aware of a products existence through:
    A. Family and friends.
    B. A global product development update/ news feed for new products. A technology development readiness (i.e., product readiness) list/table. InterSystem technology development working groups (teams) provide development updates that are available to everyone.
    C. A global online database search/inquiry of all products (database includes all products to be available, currently available, and previously available).
    D. A user need/preference survey [for product and/or service].
    E. Browsing products in a warehouse.
2. In the market-State, users may first become aware of a products existence through:
    A. Family and friends.
    B. User product reviews on social media.
    C. Business propaganda (advertising and marketing, including pharmaceutical sales reps, etc.)
    D. Retail catalogues and newsletters.
    E. Retail shopping (browsing in a store).

Summarily, one might ask, When "you" first became aware of a product, did you first become aware of the product:

1. In a store (market) or in a warehouse (community).

2. In a businesses catalogue (market) or on a technology development readiness list (community).
3. In a propaganda video or image (market-State social media) or in a user video or image (community).

In community, products are made available to users through:

1. User needs (and preference) surveys lead to engineered production cycles (and production flexibility).
   A. Production cycles lead to delivery of an object:
      1. Direct delivery to the individual user (as the user expects, because of their order/demand).
      2. Indirect delivery to the individual user. Direct delivery to a warehouse that the user visits to select to take-away (for personal or common access) and object(s) from a selection of available objects.

4 Access behavior

Individuals in an access-based community maintain a similar, emergent and relational value system. A functioning access-based community necessitates appropriate sharing and caring behaviours reflective of a relational value system and conscience in action. Herein, sharing refers to using an item and then returning the item so that it can be used by others. The process of sharing the use of community accessible items is commonly known as collaborative consumption. Collaborative consumption is based on an economic model where goods and services are technologically designed for sharing ("checking out"), instead of being designed for owning, which is similar to the notion of "renting" in early 21st century society, but without currency exchange.

Note that in the standard collaborative consumption model, the idea of 'caring' refers to "taking care" of items that are being temporarily used and accessed by an individual or group (i.e., not intentionally damaging items).

Communities that recognize the involvement of a value system in the process of deciding often maintain a screening process for the inclusion of those who originate from a different socio-economic system into their community. The screening process exists is to ensure that those who are included within the community share the same purpose, values and emergent approach to the process by which they arrive at decisions that affect everyone's resources. In other words, values influence access behavior (both social and material).

Also, this system is designed to incentivize collaborative behavior [by structurally facilitating it]. If not everyone can have the same number of what you are having, then your demand is in **overrun** and out of sustainable alignment with the community's current value decisioning structure. And, contextually, the system maintains alerts for events where someone's demand is likely to dis-align social stability from human fulfillment. Yet, herein lies the opportunity between individuals in community to collaborate and develop something synergistically more well designed than the design which was denied [for its viability] as 'overrun'. The 'overrun' alert represents an opportunity for improving our designs for greater fulfillment in access. Often, a design denial represents an opportunity for learning, growth, and adaptation, which might involve individual growth as much as social or material.

4.1 Product returns

I.e., Returning unwatned items, returns.

In community, there is ordering and/or selecting, accessing, and then returning to library or recycling. The concept takes on a slightly different meaning in the market. In the market, it means paying for something, disliking it, or having it break quickly, and returning it for a refund of the payment price. There is still the concept of a "return" in community, but the number of people who return objects they have ordered and/or selected to access for their life-span, and then immediately returned, is negligible. In the market a certain percentage of people return things; even more people return things when they purchase them online. Some retailers can have up to a 40% return rate. If something goes seriously wrong, it could have a 90-100% return rate and bankrupt the company. Product returns are a nightmare consequence of the commercial industry, particularly the online retail industry. The whole logistical system of returning objects uses vast amounts of resources in the early 21st century.

Remember, the market meets needs aposteriori (after) production -- there is production, and then users with the purchasing power trade tokens for access to the product/service. The user-product equation becomes balanced/calculated after production. In community, the user-product is planned in the form of a production habitat, which is balanced/calculated [as a consensually engineered solution] before production.

Logistics are necessary in order to return products that have been purchased but are no longer wanted, because

1. They were never needed to begin with.
2. They usage didn't meed required/expected functioning.
3. They failed unexpectedly.

In the early 21st century, a huge amount of resources and planning and money goes into returning items. User-integrated planning ensures that access (and resource usage therein) is most efficient at meeting human needs.

Users in community have full information available to them about the differences between options that are available for their selection (i.e., there is transparency), on both the:

1. **Design-control side (a.k.a., solution design side)** - as a stakeholder, can I participate in the development of the options?
2. **Actual-options side (i.e., user "freedom of" access side)** - why are they the actual final selections available; what is the reasoning for having the current selections available; how was the current selection developed and for what purpose? Where an actual/specific option is selected over other/another options, which option is selected, and why?
3. **Comparison side (a.k.a., intelligence side)** - what is the difference between the options; how does each option meet needs; what is the likely consequence of applying each option to meet needs?

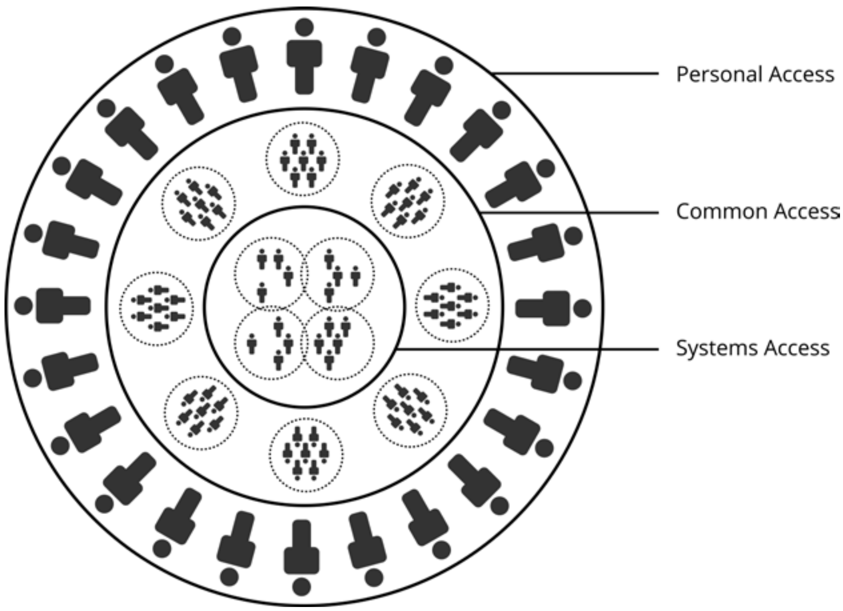

Figure 30. *The three forms of access Personal, Community, and Systems Access.*

5 Access designations

When a good or service is produced, then it becomes accessed (i.e., used or occupied) by an entity or entities in the community and receives one of three access designations.

In community, there are three core categories of access:

1. Contribution to Team access, which produces:
   A. Common access locations and common items.
   B. Personal access location (dwelling) and personal items.

Hence, the three access designations are:

1. **Team access** (a.k.a., systems access, InterSystem access, InterSystem team access, contribution user access) - work in society as part of the contribution service on societal services and objects. These contributors are users of the contribution system.
2. **Common access** (a.k.a., "community" access, “social" access, common user access) - commonly accessible services and objects. All community users have this access.
3. **Personal access** (a.k.a., individual access, personal user access) - personal identity only accessible objects. All community users have this access.

In Community, goods and services are accessed, including the habitat service operation itself, under one of three access [designation] categories. Every economic good or service is articulated and accessed through one of these three access designations. Briefly, ‘Systems access’ exists to maintain, respond to, and strategically improve the functioning of community systems. ‘Community access’ refers to those systems that are open to anyone (qualified by their safe operation). “Personal access’ refers to those systems that are only accessible to individuals or families, and it involves the exclusive use of an item. Systems access users use the system for contribution. Everyone else, the individual community users, uses the system for personal and common access.

Remember, as this is an access-based economic model, resources are not owned, but are instead temporarily accessed by the Habitat’s system, the community (in a habitat), or the individual (in a community habitat). In other words, issues that are resolved into modifications to the distributed design of services (and goods) acquire one of three categorical access designations: habitat systems access; community access; or ‘personal access’.

All resources are accessed and composed into solutions that resolve the needs of individuals in a community. When the products of the economic system are accessed by an individual they are either accessed exclusively (as ‘“personal access”’) or they are commonly shared with a proximal degree of returned access (i.e., “community access”). Production services may also be accessed collaboratively by habitat systems interdisciplinary teams (i.e., ‘systems access’).

In cases where specialist knowledge is necessary certain decisions are the domain of demonstrably accountable teams who have the knowledge, and in particularly, operational/development expertise, necessarily required to arrive at a decision expediently, within an urgency timeframe. This normally involves issues with an *urgent* or *priority* prioritization.

As noted earlier, all access is temporary and may, or may not, be based on the lifecycle of the resource, or the good or service that the common heritage resource currently, though temporarily, occupies.

In a sense, these three access types represent different types of coordination:

1. **Systems access** - highly coordinated access.
2. **Community Access** - shared access through coordination.
3. **Personal access** - individual access through coordinated customization.

Herein, habitats can be occupied (I.e., accessed) in various ways (categorically):

1. **Residents:** Full-time population who maintain a localized personal dwelling with personal access products. Residents have spent some duration of time, from seven months an onward, accessing the local habitat service system on a regular basis.
2. **Visitors:** Visiting population of community members who maintain a localized personal dwelling with person access products in a different [local] habitat service system and/or are in a local habitat service system for less than seven months.
3. **Children:** Children have more restricted access to informational and physical systems to ensure safety and well-being development.
4. **Violators**: Individuals who are known to have violated a decision system protocol, and are thus, specifically monitored and/or have restricted access, while participating in restorative justice procedures.

   NOTE: Duration of access of a local habitat service system may have an affect on an individual's weight in the preference inquiry, in the decision system, for local habitat service reconfiguration via a preferential vote on a selection of options.

Universal access decision inquiries include, but are not limited to:

1. Is the requester authorized to access or request access [to the object or service]?

2. Is the object [or service] available either in the stockroom (library) or from a production unit?
3. Is the object on the list of hazardous objects?
4. Is the requester trained in handling the object?

Note: A requester is any user. A user could be a final user (as in, common or personal access), or a user could be a contributing intersystem team member working on an intermediary task (as in, an intermediary user).

5.1 InterSystems access (system use)

A.k.a., System use and system access.

'Systems access' refers to the entire operation of all structural habitat systems by interdisciplinary systems teams -- structured by the high-level variables of 'habitat system' and 'operational process'. Habitat systems use resources, goods and services to maintain their operations, and ultimately, their continued functionality and use value [to their participating users]. Economic products designated as "systems access" are [de-] integrated into the structure and functioning of the Habitat by those individuals who have the necessary knowledge, skill and responsibility for the system(s) into which the iterative solutions is being integrated. Systems access involves a high coordination of decisive action.

Each Habitat system involves a series of interconnected operational processes. These operational processes exist along an urgency spectrum. The urgency spectrum is a mechanism for the prioritization of all articulated issues in the community.

The Habitat's systems maintain the structure and economic lifecycle (e.g., production-recycling) of our very community, and they exist to meet the ongoing needs of individuals in the community. These systems structurally orient and organize the manner in which individual needs are met. Some economic products are of a life support nature, some are of a technological support nature, and others are of a social and recreational nature. These needs are reflected in the structural organization of our community. All economic products are composed of some form of interrelationship between resources and tasks applied to the structural redesign of the Habitat.

The Habitat System is divided categorically into four sub-systems: The earth; the life support system; the technology support system; and the facility system. At the core of the system is the earth, the natural environment (resource production, regeneration, and storage subsystem). The life and technology support subsystems are secondary core, then the facility subsystem exists as the capstone that facilitates a greater creative potential in our emergence. A capstone requires the support of all those stones beneath it. Essentially, the other habitat systems are the support structures that create an environment where every individual can pursue their highest potential self/life experience.

The Real World Community Model guides the process of change for each of the Habitat's systems. Subcomponents of the Real World Community Model include but are not limited to the phases of planning, production, integration, and feedback. Here, the Strategic Preservation Planning [operational processing] phase involves the iteratively formalized and parallel inquired solution-redesign for the full habitat service system. Who formalizes the plans? We do as individual users, as community sharers, and as teams of coordinated contributors (or "feedback sharing teams").

The operational processes of 'Maintenance and Operation' and 'Incident Response' solely involve the interdisciplinary systems teams responsible for the system(s) in question. The strategic preservation planning phase is structurally maintained and formalized by interdisciplinary systems teams, but as a platform it is neutral in processing transaction requests at that operational level. Alternatively, the 'maintenance and operations' and 'incident response' systems tasks are assigned and responsive to (access by) accountable interdisciplinary "teamed" individuals. Here, teams maintain access control by identity to the responsive modification of these operational environments.

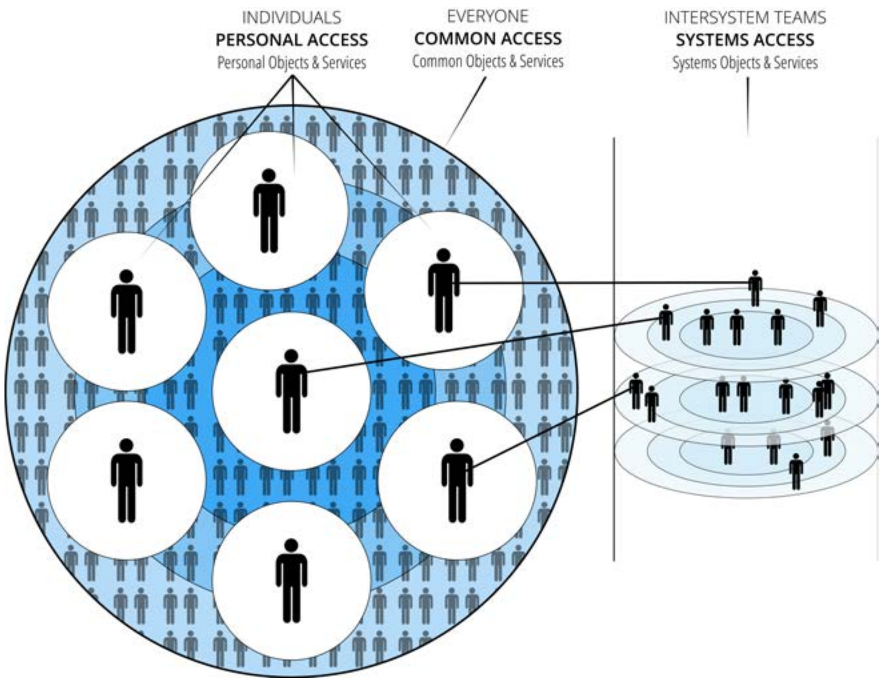

Figure 31. *The three forms of access designation in a community-type society are InterSystems access, common access, and personal access.*

However, at the strategic preservation planning level this "access to modify" is distributed among all identities in the community. The interdisciplinary teams are themselves composed at this level of planning. Even the selection of an interdisciplinary team itself is a formalized planned-for event at the level of strategic preservation planning.

There are multiple ways in which habitat service system tasks are created and distributed.

5.1.1 Access levels

Inside 'systems access' (or 'root access') there exist levels of access associated with the priority urgency of operational processing tasks. Everything about these levels and their access is transparent to everyone in the community and access to these processes is selectively chosen by a distributed and planned agreement network.

There is likely to exist criticism around the inclusion of the notion of 'access levels' into the community by those who value "freedom" in the form of exclusive economic power to do whatever they want with their property. For example, some might say, "if I want to blow up a mountain that I 'own', I have the 'right' to do this." If that is how one defines "freedom", then the freedom of opportunity to develop to ones highest potential through this community system will definitely impose on that "freedom". The mountain has likely existed for hundreds of thousands of years; it is a mind-boggling thought that a human being that exists for a fraction of that time could "own" it and decide to destroy the mountain for no other reason than to watch the explosion. Do you see the difference in the descriptions of freedom – the freedom to develop oneself and ones society versus the freedom to de-construct oneself and society for temporarily rewarded pleasure; where is the choice, really? Humans like all living beings respond in an emergent manner to environmental signals. If the signals are continuously triggering aggression and competition among individuals in a population, then society will experience violence as well as the clawing desire to have greater access than others. Remember here, violence exists along a spectrum.

Now, let us grant someone for a moment the argument that [some] humans are just violent by nature. Let us just say that there will always be "bad people" who want to do "violent things". So, the best way to mitigate those violent peoples impact on society is to not give them armies, intelligence establishments, law creating powers, ownership over natural resources, managerial positions over others, capital in general, and especially not the ability to monopolize violence (i.e., police), or even the exclusive use and occupation of something or other (i.e., property) with which [in competition] they are incentivized to monopolize and tyrannize. It would not be wise to design a society where they could gain access to a hierarchy of power, to great acquisitions of property.

The access levels described herein are strategically designed not to form into social control hierarchies; instead, they are [strategically] participatively horizontal – they are openly contributory task positions that follow through the changes requested to be made to the system(s) we all rely upon. They involve output decisions from our formalized and distributively agreed upon information-decisioning re-solution system. Sometimes, of course, teams will have to make localized decisions about the 'in-place' systems they are operating within when an incident (or other event) occurs. And, although these decisions are transparent to the community they are consensually agreed upon at the scale of a team.

Fundamentally, the type of access being described here is not exclusionary; it is participative. Participation in a system must be coordinated if the system is to exist optimally and remain resilient. The allocation and occupation of resources are processes through a decisioning system where humans participate of their own volitional accord. The decisioning system says - this is what we are capable of doing and here are the different design possibilities; here are our resources and here are our needs, how are we going to approach this circumstance and what do we desire out of this event? No one in community is coerced (or otherwise forced) to labor for any design -- we either work to keep our community adapting and developing, or we don't and we watch the entropy of our total system gradually grow.

In order to truly understand participation, one has to understand the Community's social model, and hence what this type of a value orientation actually means. And, it is a social orientation reflected in the behaviors of individuals in the community, whom are also horizontally distributed among contributory interdisciplinary teams. Essentially, this decision model as a whole cannot be understood in its entirety without also understanding the design of the social model (i.e., it is a treatise; to understand one part another part must also be understood) - one has to understand the meaning behind why work is complete as well as how it is completed.

> **CLARIFICATION:** *The interdisciplinary teams could be seen as a collaborative operation; whereas, 'community access' is more akin to collaborative consumption.*

5.1.2 Certification

Some levels of access may be dangerous without a sufficient skill or education about the operation of the service, technology, or procedure in question. These services (etc.) generally require certification, regular re-certification, and possibly, continuous education (note that in the market, these services are often regulated by the State). However, because there is no State in a community-type society, there is no conception of a 'license' given to someone by authority. There is, however, certification and re-certifications for specific work/contribution positions.

5.2 Community access (community use)

A.k.a., Common access/use.

Community access refers to the sharing of goods and services among a community. When certain resources, goods or services are shared by individuals in a community, then a "community of access" is said to exists. A community of access is most easily recognizable as the form of interaction that occurs within the nuclear family unit where certain useful items are shared by all members of the family. Sometimes these items are stationary and part of a larger architecture (e.g., furniture, television, cabinets), and sometimes these items have no fixed location of use (e.g., bicycles, cookware, tools). The one characteristic these items all have in common is that they are used temporally and have no static relationship (e.g., private ownership) to any individual or group of individuals. They are accessible to everyone contingent upon their safe use. Individuals use them on a temporal (or temporary basis), and then they are returned or simply left for another person to use.

Resources, goods and services with a 'community access' designation become available and shared by everyone in the community. It is relevant to note here that the handling of some technologies requires training. If a resource, or good or service, cannot be safely accessed by an individual then the individual has the social responsibility not to access it at their own and the community's potential expense. The operation of some technologies present inherent dangers to others in the community. The operation of a motor vehicle is one example of this. An individual must be trained to safely operate a motor vehicle; it is a learnable and learned skill. If someone were to drive a motor vehicle without sufficient training they would put others' very lives at risk.

'Community access' items are "consumed" through sharing (or shared access). Conversely, "personal access" items are the exclusive use of an individual or family for the item's particular use lifecycle or desired use.

Community spaces are by relative degree functional for multiple different purposes under a **scheduling strategy** (i.e., layering in time). During one part of the day a recreational performance may be held in a space, and during another part of the day the room could be used for a sporting activity. Some architecture, however, has been designed to meet a technical function. A technically fixed squash court, for example, is a squash court and you can't do much else in it. When it is *occupied* by two people playing squash, then it is *in use* and only usable by those individuals using it. At no point in time does it become the 'personal access' of the players. The players use the court temporarily; they share it with others via a time scheduling strategy. Alternatively, a research laboratory may have been specifically designed for a defined research purpose and have special equipment in it that is fixed or cannot be easily re-located. This [existent object] represents a long-term "spatially represented" project area; and it too is scheduled for. If a space is to be occupied for a continuous community-oriented direction, then it is "projected" for by planning. These function-oriented 'community access' structures have become part of the continuous infrastructure of the Habitat System, as well as being integrated into the lifecycle of the habitat.

'Infrastructure' at the deepest level is not a static set of building blocks that serves as a kind of fixed foundation for economic activity, as it has come to be regarded in popular economic law. Rather, 'infrastructure' is an organic relationship between the technological service systems and their task constructors that generate the living economy. In community, the users are the intentional task constructors ... our intrinsic motivation is engaged and we become extremely capable [given structural capacity].

The design and production of 'community access' goods and services goes through at least the process of planning, production, and feedback. A percentage of 'community access' goods are also integrated into the infrastructure of the Habitat by interdisciplinary project teams. The planning phase of all 'community access' goods involves the economic decision system (i.e., the parallel process of open inquiry).

Please note that 'community access' items are produced in some quantity and a quality. The exact quantity produced is determined by demand for the product through the articulation and preference inquiry processes.

Here, there are two aesthetic options a single type of 'community access' item (or service) can adopt:

1. **Categorical [task] customization** - a known and finite number of customizations exist. In other words, the task has features that can be turned on and off by the user to customize the experience.
2. **Standardization* (standard task)** – no customization exists. In other words, there are no features; there is only that which is standard.

** Standardization [of genre components] is a micro-calculation strategy. Community use items (as those items that we share) are designed through our ability to construct comprehensively feasible solutions to issues.*

In a preservation-oriented economy the 'quality' of an item is determined by the items *functional* and *material integrity*. It is a strategy to produce all 'community access' items with a single quality - the item is of the highest material integrity and the item meets its required functional need. Material integrity is required to provide sustained functionality.

When a solution's demand and resource requirements are known, then production becomes a matter of whether the product can be produced in sufficient quantity to equitably meet demand (i.e., distributive justice). If an arrangement of resources or schedules cannot be arrived at to meet demand, then the only equitable action would be not to produce the product until sufficient resources are made available or the context in which a demand arises changes. Here, the number of different customization may a determinable variable.

5.3 *Personal access (personal use)*

> *A.k.a., Personal use, individual access, family access/use.*

'Personal use' items are easily understood as those items that are occupied by an individual or family. 'personal access' refers to the exclusive use of an item, potentially including, but not limited to, items such as a toothbrush, personal computing devices, objects made by, given to, or bought by an individual, and customized or personal works and instruments. Conversely, community access refers to that which exists in the domain of the community, accessible by the community, and no single individual or group of individuals have exclusive use of. When resources are accounted to an individual as personal access, then future usage of them by others becomes "invited access" only.

Whereas, 'community access/use' items are consumed "collectively" (i.e., shared). "Personal access/use" items are the exclusive use of an individual or family for the item's particular use lifecycle or time-duration of desired use.

'Personal use' items cannot be used by another person or family for the duration of their use life-cycle; and if shared usage thereafter is desired by the accountable individual, then it is by invited access only. This includes, but is in no way limited to, health and hygiene items (Life Support), personal communication devices (Technology Support), and a personal home/dwelling (Life Support). 'Personal access' may also include, for instance, customized service objets, such as customized personal musical instruments (as part of the habitat art and music sub-system). Some service-objects are produced for the community and may be "fully consumed" by individuals, and others may be re-used over time. Single use medical equipment, for example, is standardized and produced for the community, but consumed by the individual (personal access). A cafeteria is produced for the community (via an InterSystem habitat team), and is accessed as a continuous service operation for common access. Dwellings are produced for the community (via an InterSystem habitat team), are a continuous service operation, and become the personal-access service-object of an individual and/or family of individuals.

The difference in 'community access' versus 'personal access' lies in how the following questions are answered. When the item is not being used:

1. Is it part of or within the structural personal space of someone (e.g., furniture, fixtures, attire & adornments)?
2. Can it hygienically be used by someone else?
3. As it concerns emotive privacy (i.e., emotionally healthy conditions of personal space and restoration), can it be used by someone else? Personal use items cannot be used by another person for structural, hygienic, and emotive privacy/restoration reasons. A toothbrush, surgical needle, and other such items cannot under hygienic conditions be used by another person. A person's home, their bedroom, their furniture, their smartphone, their personal journal (i.e., healthy emotional conditions of personal space) cannot be used by another person (unless they selectively and subjectively provide access). Personal space (and "privacy") matters because its presence allows us to determine who we are and who we want to be, it also provides a space for restoration and personal communication.

   For instance, if someone's bag is closed then it would be expected to be an invasion of privacy to open their bag without permission, let alone take anything out of it. Behaving in this way would be considered not only a violation of emotive space, it would also be a violation of "personally" structural space. The ordered contents of the bag are the personal structure of the current user. The architecture of the bag and that which is inside of it is part of the personally structured space of its current user and it is a violation to access it without their access permission, which does not mean that the current user "owns" the resources or structure that is currently designated as 'personal space'.

It is considered a 'personal access' violation to access these in-service (and otherwise, personally occupied) objects beyond the permissions given to access them by the user-individual. And, as a community, we seek to make it structurally simple to identify and "secure" (where desired) 'personal access' permissions.

Before accessing another's 'personal access' space/ item, we ask: "Do I have your permission to enter your personal space? Or, may I have access to this item?"

'Personal technological access' items are those technologies that are continuously within an individual's personal space. For some people this may be a watch, a smart phone, the technological infrastructure of a home, or any other technology frequently used. Conversely, 'personal aesthetic' items are those "objects of art" that are found in the personal spaces of individuals and also created by individuals.

Someone may use a toaster, and although that toaster is "picked up" from an access center, the toaster has become part of the structure of someone's personal home, their personal space. The integration of the toaster serves a localized functional purpose in someone's personal space. There may come a time when the toaster breaks, the family no longer wants a toaster, or another multi-use technology absorbs the function of the toaster. Or, they may no longer desire the use of a personal home toaster and instead use the device in a 'community access' space where multiple individuals come to prepare food and eat together. Those products that become part of the structure of individual's personal spaces are highly dependent upon and influenced by need, want, culture, multi-functionality, and modularization. In a community space, the toaster would be a 'community access' item because it is being shared by the community. In someone's home it would be considered a fixed structural 'personal access' service item. In either case, usage is projected for by 'demand' into the decisioning system.

Some items may be used at both a community and a personal level, and others are exclusive to one or the other. Single use medical equipment, for example, can only logically be used at the 'personal access' level, unless a technology at the community-use level subsumes it functions; for example, using a pressure injector for medication as opposed to a needle for every person. The pressure injector is a less wasteful technology and the entire device does not need replacing with each use. But, pressure injectors only operate within certain environmental parameters the may not be the optimal delivery medium for a particular situation, which are 'functional use' considerations.

Both 'community access' and "personal access" items are produced in some quantity and a single, optimally value aligned quality. However, personal use items have one additional aesthetic category over community use items. There are three possible aesthetic forms that a single "personal access" an item can adopt:

1. **Individual customization** - customized by or for the individual
2. **Categorical customization** - several categories of customization exist from which to choose, which are finite
3. **Standardized** - no customization.

Some 'personal access' items are customized for the individual, some are standardized, and some have categorical attributes (i.e., having a finite variety of aesthetic designs).

Here, 'personal access' is a distinct category of access. However, some models may include 'personal access' as a sub-category of 'community access'. This model does not include 'personal access' as a sub-category of 'community access' because there exist some items that for whatever reason have never been shared with the larger community. For example, if someone takes a private photograph or writes something private, something emotively private, then that item (or thing) has never been and does not have the characteristic of 'community access'. Conversely, a toaster is a community accessible item that someone may use exclusively for its lifetime ("personal access") or may use for a single use and then return (temporal personal- access) or may use in a community setting ('community access'). In this case, it would be true to say that the toaster as a "personal access" item is also a 'community access' item. The toaster has the potential of being distributed to both access designation categories and when returned it is recycled [in some way] by the habitat service system.

5.3.1 The personal information system

> *"Scarcity and abundance are foundational and contextual ideas. They each give rise to a distinct system of thought and a number of rules, characteristics and measures which only make sense within their own system."*
> *- Buckminster Fuller*

An individual's personal information system is designated under 'personal access', and content therein may be kept private or shared. This system is similar to Google Drive, where files can be kept private, or shared.

We acknowledge that when a creative expression enters community awareness, then it potentially becomes accessible community-wide, and among community, no entity exists to restrict its storage or dissemination [on personal information systems]. There is no force in the community to restrict or prevent this. Herein, no one can prevent anyone else from sharing something in their personal information space. Similarly, no one can prevent anyone else from downloading content that enters community awareness into their personal information space.

Herein, it is wise to remember that all forms of expression, creative or otherwise, potentially become accessible community-wide when they are shared with another person. A another person with whom you share something "private" may chose not to honor your request to keep it private. And in community, there is no systems-level reprisal you can take against them and nothing you can do to prevent them sharing the information once it is in their personal space.

In the Community there are no licenses to any informational content -- there is no body to create them and no body to enforce them. There is no meaning to idea of a "license" given to any informational content. Someone may attach any license mark (e.g., trademark or copyright mark) to any content they want, but it will have no meaning in community.

For example, if a member of the learning community paints a physical picture of a "unique" scene, then that painting is their 'personal access'. However, if the painter shares the painting with a larger audience either through a social viewing or by sharing a digital photo of the painting, then the visual image of the painting in its digitized form becomes accessible community-wide without restriction; any degree of restriction necessitates a force-based power structure. The original painter cannot prevent or hinder the sharing of the digital content or the repainting of the work once the work enters community awareness. This is a principle built into the technical design of the information system itself. Note, the initial physical painting is still the 'personal access' of the painter. That personal access item may be provided to another (via trade or freely gifted) and by doing so becomes the other person's/family's personal access.

6 Socio-technical [life] phasing-in access to specific service-objects

It is possible for a community-type society to phase in access to all community services. It is imaginable that a society may only consider someone a full accessing "citizen", with full access to all community services, only, after they have completed one of the two possible life phase, for example:

1. The contribution phase of their life, or
2. The education phase of their life.

Different objects and services may be phased to individual's access at different life-phases.

The significant question here about citizenship-access to all community service-objects is:

- What does it mean to have more and/or full access over others; what access does one get after the completion of the prior phase that people in the earlier phases of life in society do not get"?

Note here that community configuration of society is different than what occurs in the market-State; because in the market-State, there are other dimensions to full-access:

1. The cost (private property pricing) dimension. To acquire something needed, how much money or tokens does someone have pay, trade?
2. Financial and/or political-State power dimension (authority). To acquire something wanted, how much authority and/or subscriber size must someone have?
3. The age dimension (once someone reaches a specific age, then they and their family will not be punished for a violation excessive of their age access level (e.g., the drinking of alcohol age of 18 or 21). At what age does someone get the legal ability access (really, purchase or have purchased it for) to some service-object?

7 Localization of access

A.k.a., Access localization.

Productions of service-objects may be accessed in the following ways:

1. Services access (a.k.a., access to processes, support):
   A. Produced for fixed geospatial area of service - Users of fixed services must go to geo-spatial locations where the service and associated user objects are accessible (and may or may not be geo-fenced). For example, the habitat itself, or a swimming pool, a special event, the residential sector, etc.
      1. Each habitat is a fixed production (habitat master-plan of operation) for some duration of years (generally 3-5 years); produced as 'habitat' unit.
   B. Produced for non-fixed geospatial area of service. For example, communications or transportation services, which generally cross habitat sector boundaries.
2. Products access (a.k.a., access to objects, goods, tools, technologies):
   A. Produced for delivery:
      1. To be picked up by the user, as expected/planned (for common or personal access).
      2. To be delivered to the user, as expected/planned (for common or personal access).
   B. Produced for library/warehouse accessing:
      1. Warehouse storage (access warehouse, access center), then
         i. To be picked up by a user.
         ii. To be delivered to a user.

In concern to localization, products may be accessed with some spatial relationship to the fundamental unit of production, a 'habitat', in the following ways:

1. Relative to a local habitat:
   A. Local access to the services-objects local to a specific habitat. This in inclusive of team, common, and personal access.
   B. Access to the wild and to architectural-infrastructural services constructed in the wild (i.e., access to everything outside of local habitats). This is inclusive of team, common, and personal access.
   C. Access to [heavy] production in the wild. This is inclusive of team access only.
2. Within a habitat:
   A. Direct delivery to a user (by specific order/demand):
      1. To a user's personal dwelling - item is delivered to user's personal dwelling.
      2. To a central access distribution hub - user picks up item at some designated central location.
      3. To a geospatial location in habitat (other than the user's personal dwelling and a central access hub) where the person is currently. In other words, delivery to where they are spatially located now, outside of their personal dwelling and a central access-distribution hub.
   B. Indirect delivery to a user (may produced by general user survey, or continuous production data):
      1. Direct delivery to a warehouse for storage, browsing, and probable selection [for usage] by some user in the future.

A set of productions are planned for and made accessible:

1. Access localization:
   A. Users may request through warehouse and/or delivery access data and/or sensor data on preferences for what is under production. If, for example, more people access as personal access a set of blue color shoes over white, then during production there is the flexibility to change that production factor to match demand.
   B. Users may go to access centers to [freely] access products stored in warehouses. The available objects for access are all known, on display, and reasonably expected. Users view "displays", select, the warehouse delivers thereupon to the waiting user, and the user takes-away as [free] access.
   C. Users may [freely] accept/request delivery (via transport).
2. Access production:
   A. Users may [freely] accept/request on-demand production, through a 'collaborative user-producer access interface'.
   B. Users may [freely] accept/request access to geo-spatially localized services (Read: common access) within a habitat. Including, users who may [freely] accept/request a scheduled date and time of access to the geo-fenced service-objects, which typically require user-access agreement.
   C. Users may [freely] accept/request a new cycle of production; which must be decided, solved, produced and distributed.
      1. Light re-production every 'instant' (on-demand) to 'year'.

i. Light production cycle consumer-needs survey (a.k.a., consumer survey, production survey, etc.).

D. Users may [freely] request a change to the current production cycle. This inquiry is a light production cycle consumer-needs survey (a.k.a., consumer survey, production survey, etc.).
   1. Preferential change to light production cycle consumer-needs survey (a.k.a., consumer survey, production survey, etc.).
      i. Sensed, as in warehouse sensed, and control responded with more of the preference.
      ii. User articulated preference change for one version of the light production over a less preferred other.

E. Users may [freely] request a change to fixed habitat re-productions every 3-5 years, or other count relative to that local habitat's population's decisions (a.k.a., consumer survey, production survey, etc.).
   1. Habitat master-plan solution inquiry to ensure services meet needs sustainably. Direct working group master planning and local habitat population selection for operation (where there is a spectrum of trust and control).

F. Users may [freely] accept/request a dwelling-habitat life-cycle.
   1. Users may [freely] request a change to the habitat life-cycle master-plan every three to five years, with flexibility accounting for preferences.

8 Access prioritization

Social and recreational needs acquire their own internal prioritization. As was already noted, life and technological support needs are prioritized by their operational urgency. All goods and services associated with the life support and technology support systems are produced through the operational process of the Strategic Preservation Planning. This includes all community and 'personal access' items under the Life and Technology Support systems. Items produced by these service systems are usually not functionally customized to the individual unless there is a larger systematic bio-physiological reason for doing so, like the inside of someone's home. These items are generally standardized or a finite categorical aesthetic customization is applied - after a query of aesthetic preference. Life and Technology Support products meet needs that allow for the orientation and continued preservation of our community. Businesses this very day are planning the designs for most technological goods and services. The idea of planning something because it is a more efficient and effective process than making a subjective choice is not a new concept. The process of planning is just being applied by a community with a common approach to deciding.

> **INSIGHT:** *Arriving at technologies that allow the rapid thought-responsive transformation of our environment in an unplanned way is not wise. Today, there are things that a few people can do with technology that risk many other people's lives (e.g., feeding antibiotics to farm animals en masse, or developing and deploying biological weapons). We have developed our technologies to a miraculous extent. And we have incredible tools because of it, but we have not sufficiently developed our emotional, spiritual, and mental capabilities so that we can handle the technologies (them toward our fulfillment and flourishing) we have and orient them toward our fulfillment and flourishing.*

TABLES

Table 9. Personal Access Designations*: Personal information system sharing options.*

Sharing option	Definition	Cryptographically secure; Account required to access
Not shared (i.e., kept cryptographically private)	No one else can access the file	Yes; Your own account only
Specific people	You are the only person who can access the file or folder until you share it with specific people or groups	No; Yes (to edit or comment)
Anyone with the link	Anyone who is given the link to the file or folder can access it	No; No
Open web access	Anyone can access the file or folder on the Internet through search results or the web address	No; No

Technology Inquiry Accounting

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Abstract

All socio-technical platforms must account for technology. When engineering anything, its object composition, and the composition of the environment where objects are distances from one another, must be accounted for. Technologies are one necessary element for which to account when planning a societal project and operationalizing a societal product. Technologies are accounted for through a global technology survey. In the market, technologies are property. Spatial resources (true resources) are objects (i.e., made of matter/shape).

Technology can aid in this purpose, and make the journey one of optimized flourishing. An integrated, master-planned habitat is a technology, in which many other technologies function. Technologies are the foundation for all modern material services. It is possible to link all life, infrastructural, and exploratory services to their underlying production (means of production) and operation (means of operation) technologies (and human contributors).

Graphical Abstract

Image Not Yet Associated

1 Technology accounting and inquiry

A.k.a., Technology accounting, technology functioning.

All technical-based platforms must account for technology. Society, as a socio-technical system, must account for technology. Technology is an enabling element in society; it enables doing more with less. Technology can be accounted for through technology surveys. In the market, technology may be is considered defensible property. In a community-type society, technology is a tool for well-being. Technology is accounted for in order to optimize societal configuration. Technologies can be compared between. A solution within the decision system can compare the technical requirements and consequences of different technologies. The orientational value system within the decision system will compare analyze the technologies in relation to formalized desirable conditions. Some technologies are less well understood and developed than others. Technology can be identified by the manner in which the technology is actually used by individuals. Technology can be accounted for by the work done by scientists and engineers (as developers). The diffusion of technology through cities in a given society can be accounted for, by at least, resource availability, knowledge availability, and local [cultural] values. Technology exists to improve human well-being, including access to goods and services.

A simplistic view of the technology accounting system is:

1. What technology is required?
2. What technology is available?
3. What technology will be or should be available?

1.1 What is technology?

NOTE: *Community articulates reasons for using technology, while applying technology systematically for human and ecological benefit. In early 21st century society technology is selected and applied ad hoc and for profit.*

The word technology comes from the Greek word “tekhnologia” (or, “tekne”), which means: art, skill, craft in work; method, system, an art, a system or method of making or doing. “Craft” originally meant “weaving” or “fabricating”. technology is a functional subsystem of modern society that observes the world of tools, techniques and applications using the code (hard material code and/or soft digital code; or genetic code). It is important to remember that in a habitat, technology both fills in architecture, and has an architectural enclosure itself.

Today, technology may be defined as (i.e., technology is):

1. A materially and/or informatically encoded repeatable and empirical function.
2. An expression of meaning through values that encodes functionality into a specific configuration of matter that processes material as energy and information as intelligence. Technology is an expression of meaning that expresses values and encodes functionality in a specific, materially and/or informatically usable system.
3. The intentional application of knowledge. If technology is applied knowledge, then habitat service system represent the applied encoding of technology into a habitat.
4. The applied result of the logical ordering of factual technical relationships; technology is applied knowledge.
5. The practical application of knowledge into a construction for a function. It refers to a technological process, method, or technique such as machinery, equipment or software needed for a service or process to achieve its purpose. Even a practice or process can be a technology, although in common parlance, people have a tendency to think of technology solely as something which is material.
6. Some thing with a function or utility to it. Technology is simply the application of [accurate] knowledge toward the extension of function.
7. A systematic creation that allows an organism to do a task more efficiently than using its body alone.
8. An engineered creation.
9. The result of effectively re-structuring an environment through intention.
10. A material object with measurable dimensions and material attributes.
11. A procedural model (or procedural object) with measurable affects on information and conceptual attributes.

Technology is [systematically] built on prior verified and understood patterns of relationship in a commonly objective, existent reality. Technical processes underlay every designed structure in the real world. At a societal level, technology is that which is tested and works repeatedly.

There are two levels to technology (in the economy/society); wherein, some technology (a.k.a., a technical unit) produces other technology (a.k.a., a good, final product), and that other technology (a.k.a., good, user deliverable) has use in completing human needs for fulfillment (which, is "good"). Hence, there are:

1. **Technical units (a.k.a., production units)** that produce, and possibly sustain, the product units.
    A. **Technical [production] units** composed of people and objects *doing work for users* (notice the perspective here is that of the contributor, who is doing a service to others in need):
        1. **Construction technical units (a.k.a., production construction units):** Some of

these technical units produce the machines that produce the final product. Construction technical units will need to be operated and rebuilt as they wear out.
   i. This is an InterSystem Team user [contribution access] category.
2. **Production technical units (a.k.a., production/operation units):** Some of these technical units are the machines that produce and operate/service the final technical user product (e.g., house, tennis racket, painting, computer, etc.). Production technical units will need to be operated and rebuilt as they wear out.
   i. This is an InterSystem Team user [contribution access] category.
3. **Technical [usage] units** *working for users* (notice the perspective here is that of the user; the user is expecting/demanding a service with objects):
   i. **Product units (a.k.a., deliverable units, usage object-service units)**: Some of these technical units are the actual final object (in service) to and in usage by a final habitat user. Final products will need a service behind them to maintain, sustain operation, and replace them. There are two users of final products:
      1. **Common and personal user** [common heritage access] categories. These users use the services of the InterSystem Team.
      2. **InterSystem Team user** [contribution access] categories. These users produce and operate technologies that meet common and personal user needs.

For any given technical unit there is the generation and application of that technical unit:

1. **Generation** (of technology as a habitat service):
   A. Products that are tools that produce the machines that build the service-objects.
      1. The tools that build the production machines.
      2. The production machines themselves.
2. **Application** (of technology as a habitat service):
   A. Usage of the final service-objects by users.
      1. Common/personal.
      2. Intersystem team.

The two most significant constrictors on technology generation and application in the early 21st century are:

1. Power generation (as part of the life support power sub-system).
   A. Is there enough power to run the production machines, their construction through to service operation, as intermediary [technical unit] service-objects?
2. Mineral acquisition (as part of the technology support materialization sub-system).
   A. Are there enough minerals to build and maintain the production machines and final [product unit] service-objects?

It is important to clarify the difference here between the following technology-related terms:

1. **Technology** - is any confidently functional arrangement of matter. Is the use of scientific knowledge and methods in order to meet some purpose and/or accomplish some function. Technology is that which is:
   A. **Tool** (i.e., an applied functional arrangement of matter) - a device (object) with a function, and in an economic sense, the tools are the technical units that produce and operate/service the final user products. In a sense, even the final user product(s) are tools for the final user. Technology is "tools" all the way down (i.e., throughout the economic-material system -- where objects are part of services that meet human socio-technical needs for service support):
      1. The tools that produce the machines that produce a final object.
      2. The machines that produce the final product.
      3. The final product in service to meet the required user function(s).
         i. **User product (a.k.a., "good", service-object)** - the final object's operation to demand.
2. **Technique** - a way of doing a specific activity. Typically, a technique involves an activity that uses a specific tool or set of tools in a specific way. One specific tool can be used in different way (i.e., can be used with different techniques). There are both general techniques and techniques specific to specific tools. Some common examples of generalized techniques include: form-ability, machin-ability, cast-ability, mold-ability, weld-ability, heat-treatability.
3. **Method (a.k.a., process)** - a general step-by-step approach to doing something.

> **NOTE:** *The concepts "technology" and "technique" both come from a Greek word meaning the study of an art or craft.*

All technological systems are:

1. Purposeful.

2. Built on/from technical principles.
3. Subject to off-normal events, including accidents and faults, due to both component malfunctions and unforeseen/foreseen external influences. Therein, some technology requires additional technology to minimize the likelihood and impact of accidents.

The primary functions of technology for a population include, but are not limited to:

1. Providing life support service.
2. Providing exploratory support services.
3. Providing for production (and materials re-cycling), communication, transportation, and information processing.
4. Making more efficient use of time.

The authentic use of science and technology accords many benefits, including but not limited to:

1. Improving the quality of lives by automating banal labor tasks.
2. Creating more intuitive, natural, and active learning and information systems.
3. Improving the quality of decisions and problem solving.
4. Improving the effectiveness and efficiency with which goods and services are distributed.
5. Supporting in the creation of an abundance of all goods and services. Among the most important benefit of science and technology in our community is that derived from technological automation. It is the effort to free the individual from banal labor contributions so that they may pursue their own interests, improving both themselves and the community.

NOTE: *The human organism is a technological construction; a technology for the animated expression of consciousness in material form. Wherein, consciousness has a technical and intuitive relationship to the form it inhabits.*

1.1.1 What are tools?

INSIGHT: *What good is technology if a society does not have the wisdom to use it to better itself and enhance the lives of everyone? Anything less than this will simply lead to a dysfunctional, technologically dangerous society.*

A tool is a device that is necessary to, or aids in the performance of an operation. Tools are the manifestation and extension of consciousness. It is possible to explain how work (Read: an operation) is done through 'tools'. In the production and use of a tool there is the opportunity to apply a strategy that orients the use of a tool in a particular direction. Someone can hammer a nail into wood, but hammering continues past a particular point, then a divot may be created, and then, a hole. All tools have a contextual and orientational use. A tool's value is "put there" by the human or system that uses it.

Tool
Concept ("noun")
1. A device or implement, especially one held in the hand, used to carry out a particular function.
2. A software program, used to carry out a particular function.

Tools are a structured part of a society's environment that supports sense-making, enables engineering, and facilitates servicing. There are both conceptual (informational) tools as well as physical (object) tools. A material tool is an object used to extend the ability of an individual to modify features of the surrounding material environment. A tool is the most basic type of ability extender and is comprised of a resources. A conceptual tool is a concept [model] used to extend the ability of an individual to modify features of the surrounding informational environment. Informational tools include models, programs, and algorithms.

CLARIFICATION: *The terms tool and technology are often used synonymous, in other cases, a tool is a specific application or instance of a technology. In some cases, tools are physical and technologies are information.*

1.1.2 Interoperability [of tools]

When multiple technologies are brought together in the form of a habitat there is a requirement for interoperability, so that the technologies work effectively together with one another as a single unit. Therein, in order to have interoperability, open standards are required.

1.2 Technology sub-classification

INSIGHT: *Technology is not a panacea. However, it can be extremely useful in solving many kinds of problems.*

Technologies can be sub-classified according to:

1. **Structure**: The structure is the components of the design object and their relationships. A system is a structured form of organization. The structure (a.k.a., architecture) of the system designed to transform information for a purpose.
2. **Process**: The occurrence of an operational transformation (or event). A process produces a behavior [for a specific function]. The behavioral process(es) represents the attributes (or "qualities") that can be derived from the designed object's structure. A system is a form of organization that includes at least one process.

3. **Function**: The objective [purpose or goal] for the transformation within and overall existence of the system. A system is a functional form of organization.
4. **Materials**: The specific material(s) that compose the technical system (i.e., material composition).
5. **Compositions**: The specific mixture of materials that makes up a technological structure and provides a specific function.

1.3 Technology and morality

INSIGHT: *When you invent a technology you also invent the accident and/or misuse of that technology.*

If there is a new actuation capacity, because a technology provides new functionality, it is going to influence (not necessarily direct, but influence) "our" sensing capacity to pay attention to the things that can be actuated. Hence, technology extends human capacity for choice. It may sometimes also be pre-disposing it. Values influence how technology is designed. The nature of how the technology is designed affects people's behavior and influences future values. The design of technology will influence human patterns of behavior (i.e., there is a recursion loop within the social construction of humanity).

QUESTION: *Are values being intentionally chosen, or are they unconscious?*

The discovery, design, and usage of technology is likely to change behavior. The application of a technology encodes for a patterns of behavior. One technology becomes part of an ecosystem of technologies. Technologies emerge in ecosystems, and a whole ecosystem of technologies ends up predisposing a whole world of behavior. Values are what design technology, and then technology in turn impacts behavior and future values, which influences future designs. It is a recursive process. Causation goes both ways. Humans have values and design and implement technologies, whereupon the technology influences future values and the design of future technology ecosystems. Generally the values that people have guide the development and usage of the technology.

The prime historic example of this recursion is that of the introduction of the herbivorous-driven plowing technology. When animals were not as plentiful to hunt, and more plants were being eaten, then historically, plow cropping was the only method known of to produce an abundance of plants. Here, the animal animals began doing the work of plowing a field, which was is advantages for survival and efficiency of survival. Someone may still view animals as having feelings, but if all one knows in concern to the acquisition of food is plowing a field with an animal, then that is the limit of their decision space (capacity).

For millenia humans have being using animals (e.g., ox) to plow fields for crops, and beating them for a day or so to complete the plowing of a field(s). The animal (ox) doesn't want to do the work, so it has to be beaten to do it. Designing the plow and then putting it around an animal requires the human user to change their behavioral system around animals. Instead of behaving toward animals as another conscious being with a decision space and the capacity to suffer like humans (a lack of natural fulfillment), they become viewed as tools (a means to and end) only.

Technologies influence humans in the following ways, in the context of morality (Read: a value-objective orientation toward fulfillment):

1. What actuation capacities people have (including, what people have what actuation capacities).
2. What people pay attention to.
3. What is valued [in the future].
4. What people believe is real.

Technology may be considered amoral (not-orientational) or moralized (orientational) to individuals and society as a whole:

1. It is what technologies humanity creates, and what it does with those technology, that makes the technology-user combination a moral (fulfilling) or immoral (unfulfilling) choice.
2. The difference humanity creates in its internal population and ecological environment is a moral (or “ethical”) decision, that can be resolved via a standardization to a direction (fulfillment), orientation (humane values), and approach (systems science) to its decisioning.

NOTE: *In the market-State, mostly technologies that are profitable, and convey advantage over others, tend to proliferate.*

When individuals perceive technologies taking them in “dangerous” directions, consider that maybe it is really their way of life (the structure of their societal system), and their lifestyle, that is taking us in a dangerous direction. Engineered creations will take on the standards, biases, and the intentions, of the socio-economic system in which they have been designed and will be utilized. Technologies created and applied in a capitalist system will have a capitalist bias. Alternatively, technologies created and applied in community will maintain standards that orient all of humanity toward greater fulfillment and clarity of perception.

Human fulfillment is more important than technological progress and innovation. Societies that prioritize technological advancement over human fulfillment are likely to forget that the situations in which innovation and technological advancement are likely to align with fulfillment are the situations where creators and users can freely and visibly decide upon which innovations to encode (i.e., "incorporate") into their lives. Some societies put too much emphasis on innovation as a goal (or "economic growth" and "entrepreneurship"), which is to take for granted that innovation is always good for human well-being and fulfillment. In the market, innovations and products serve the (for profit and power) interests of market entities - they have a market/capitalist/State bias. Conceptually speaking, technology is neutral. For example, with electricity "you" can kill someone or make dinner for someone. However, specific technologies can be evaluated as setting up conditions that orient more greatly toward or away from fulfillment. For example, technologies that malfunction easily are likely to setup suboptimal resource usages, which has consequence for societal orientation as a whole. A certain kind of technology and/or its implementation can be seen to lead to certain kinds of effects. A given kind of technology can establish conditions that are not morally neutral. In a community-type society, technology is developed and applied through community-based value standards.

> **INSIGHT:** *If a society has the science to do something, then that society effectively has the technical-ability. If a society has the technical-ability, then it is entirely dependent upon the conditions in which the society finds itself as to whether or not the ability is actualized.*

One might put oneself in the position of technology itself, and then ask oneself, "What would I do if I was this technology?" For example, "What would I do if I were a coffee maker, a bridge, a rifle, or a nuclear bomb?" We can imagine what these technologies would do if they "wanted" to be applied.

It must be noted here that material technology is just a piece of the modern sustainability puzzle. Solving the systemic challenges facing our global community requires context and an accurate value orientation in addition to sustainable conceptual and technological solutions. Technology is not sufficient to fix our problems; we need a moral organizational architecture. Technology without morality and intrinsic motivation is likely to promote apathetic idleness.

1.3.1 A simplistic look at how technology influences society

Technology does not exist in a vacuum. There is an interplay between technology and society. A "technic" is the term given to the power-oriented interplay between technology and society as coined by Lewis Mumford (a sociologist and philosopher of technology). Mumford wrote that any given technology either facilitated the consolidation of power or the distribution of power in society. The first question that differentiates whether a technology facilitates authoritarian social systems (i.e. power consolidation) or egalitarian social systems (i.e., power distribution) is: Can anyone in society make it, or is it made and controlled by an external and centralized entity who controls access to it?

Anyone can make a bow and arrow, and so, the technology and knowledge that goes into the creation of a bow and arrow facilitates power distribution. Conversely, a normal gun requires metal, and so, those who control the mines and the means of manufacturing control whether or not any given person in a society has access to a gun. Hence, in the market where these things are owned, a gun (as a technology) is referred to by Mumford as an "authoritarian technic". An authoritarian technic is one that emerges from and leads to authoritarian social systems. Given a choice of life sustaining activities that someone could participate in, no one wants to do the work of mining. Even with modern technologies, it is incredibly hard and risky work. So, generally, people don't do not do the work unless they are forced to do it. To some degree, agriculture and mining were the first two primary slave-based economic endeavours. The work is so incredibly hard that no one wants to do it unless they are forced to.

Here, we come to realize that the technology we create, and its application to our lives, affects how we look at, and behave in, the world. Think about how cars and airplanes have changed our perspective on distance. If you drive two miles down into town and you get a mile and realize you have forgotten something, then it is not a large hassle to drive back and pick up that which was forgotten; but, if you had to walk that distance you would think much more carefully about what you were going to take with you before you left the house.

The second question that needs to be asked in determining whether or not a given technology facilitates power distribution or consolidation is its degree of sustainability. A plough is good example of how the application of a technology has influenced our behavior in historic context and led to power consolidation. A plough would be considered an authoritarian technic - over time, it destroys the soil ecology, which means that it is an unsustainable application of technology. Through its use, land becomes less hospitable to life. In general terms, the use of some technologies mean that a society's way of life can't be sustainable in a given geographic area. Through ploughing, individuals will destroy their land base; and thus, they will have to engage in expansionist behavior. And, expansionist behavior requires military force.

1.4 Technology quality assessment and assurance

Technologies (a.k.a., products, goods) are produced through productive economic work. Therein, technologies are used for productive economic work and for individual human fulfillment (i.e., technologies are deployed in two economic sectors, the production/team and consumer/user sectors).

It is important to continuously assess technologies as they originate, are materialized and de-materialized throughout society and over time. Technologies may be assessed in the phases of their life cycle:

1. **Designs** - assess optimized technological designs given access to resources and information.
    A. Here it is important to assess the design as aligning with human needs and objectives, resource availability, and physical [scientific-technological] principles/rules.
2. **Implementations** - assess whether the construction of the technology aligns with requirements.
    A. Here, it is important to assess the quality of the production (per engineering requirements and user expectations).
3. **Outcomes** - assess whether there are successes and where there are failures at meeting requirements.
    A. Here it is important to assess when technologies that have already been developed and deployed intentionally worsen or deliberately disable functions, so as to improve over time.

1.4.1 Material selection for technology

In general, a material is chosen based on the required or desired factors (i.e., responses to stimuli acting on or arising from) within the design. At the heart of the process for selecting materials in design lies the interaction of the following factors:

1. **Function:** drives (if not “dictates”) the choice of material in design. Here, function requires an object/material with shape.
2. **Shape:** is chosen to perform the required function(s) using the selected material.
3. **Process:** is what a material/object is subject to. Process is strongly influenced by the complex material (electro-chemical-mechanical, purely technical) properties/techniques of:
    A. Form-ability.
    B. Machine-ability.
    C. Cast-ability.
    D. Mold-ability.
    E. Weld-ability.
    F. Heat-treatability.
    G. Etc.

When applied together, these three factors (Read: function, shape, and process) constitute a specified manufacturing (a.k.a., construction) design.

1.5 Power parameters

A socio-technically advanced society requires electrical power to sustain its technologies. All electrical power has an energy source, that a technology interfaces with, to produce power.

The early 21st century electrical technology ecosystem requires clean sinusoidal power; the electrical power input must be smooth, same frequency, same voltage, same current, 100% of the time. The whole technological ecosystem is based around that type of electrical input.

1.6 Environmental operating parameters

> *A.k.a., technologies have optimal operating parameters.*

All technologies are designed to operate optimally given a set range of operating conditions. Beyond those operating conditions, technologies become more inefficient, ineffective, and eventually damaged.

In the early 21st century, cold weather testing conducted by the Society of Automotive Engineers (SAE) indicates EVs can lose as much as around 41% of their battery capacity at 20F / -6.6C (and even more as it gets colder). In EVs with required heating, approximately two-thirds of the extra energy consumed being used to heat the transport's cabin. Charging times become significantly longer as well. The Automotive Engineers (SAE) indicates that EVs lose an average of 17% of their effective range at 95F / 35C, if cabin air cooling is also required. In over 100F / 37.7C typical battery capacity can drop by as much as 31%. These data need to be accounted for in decisions.

2 The technology development matrix (TDM)

A.k.a., Technology readiness matrix, technology readiness level, technology readiness index, technology development index, technology development level, etc.

The technology development matrix (TDM) is an interactive visual matrix designed to track and facilitate the development of those technologies that are necessary for human life to thrive in community. The TDM is a checklist and meta-information source of what technologies, systems and capabilities are available to build a critical path to human fulfillment. The availability of this information allows anyone to get involved in tackling the difficulties and challenges associated with technological development. The TDM could be used as a "punch list" for building the material construction of a city in community.

By accessing the matrix anyone can see who is working on which technology. If nobody is on a technology of interest to you, then you drop in your abstract, your concept, and contact information. The matrix is a view into the technological possibilities and capabilities of the community.

Technology matrices are used for:

1. Decisioning.
2. Planning resource flows.
3. Planning maintenance.
4. Planning replacement (planning obselesence)

Generally speaking, technology development has three characteristics:

1. It is the process of developing and demonstrating new or unproven technology.
2. It is the application of existing technology to new or different uses.
3. It is the combination of existing and proven technology to achieve a specific goal.

NOTE: *A TDM table should identify the readiness levels of each technology.*

Readiness refers to time. Specifically it means ready for operations at the present time. Level refers to the level of maturity of equipment. Equipment that is already being used for the same function in the same environment has a higher level of maturity than equipment that is still being developed. The levels are a nine-point scale based on a qualitative assessment of maturity.

Technology Readiness Level (TRL) is an index to measure the development and usability of an evolving technology. It measures how ready equipment is for use now in an operating service. A technology's "readiness level" (TRL) refers to its phase of existence. The primary purpose of using technology readiness levels (TRLs) is to inform the resolution of a decision space concerning the development and transitioning of technology. The TRL index scale goes from 1-9.

1. TRL 1-3 = red, a theoretical concept.
2. TRL 3-6 = yellow, is being tested in the lab.
3. TRL 6-9 = green, is being applied.

Almost all the TRL scale developers and users in various perceive TRL 6 to be a major transition from research and experiment to real life implementation and operation. At TRL 6, a representative model, prototype or system, which would go well beyond an ad hoc discrete component level breadboard, must be tested in a relevant environment. If the only relevant environment to show progress is the operational environment, then the validation must be demonstrated in operational environment. At TRL 6, several (or many) new technologies will typically be integrated into the demonstration so a working, sub-scale (but scaleable) model of the system should be successfully demonstrated.

Note, however, that the idea of a "technology readiness level" does not apply if the objective of a project is to research scientific principles.

2.1 Technology application levels

The following are reference points for reading and usage of the technology application level index:

Table 10. *Technology application levels: from absent to stored.*

Technology application level	Indicators
Absent	Limited to no solution plans in this area. Limited to no capabilities in this area.
Exploring	Inquiring into phenomena in this area (research; as in, the Exploratory Service System for the Habitat Service System). Inquiring into solution plans in this area (as in, Solution Inquiry within the Decision System).
Enablable	Application of technology can be integrated into the existing state of the habitat service system.
Connected	Application of technology is integrated into the existing state of the habitat service system.
Stored ("Retired")	Technology has been removed from application.

2.2 Technology readiness levels

INSIGHT: *Capitalism hasn't given "you" any technology. Instead, capitalism gives "you" the need to buy and sell technology. In capitalism, there is willful withholding of technology and efficiency to remain competitive in the market.*

The following are reference points for reading and usage of the technology readiness level index:

1. **A TRL number is obtained once the description in the diagram has been achieved.** For example, when a technology successfully achieves TRL 5, it does not move to TRL 6. Therefore, reporting TRL 6 should be conclusively done with TRL 6 activities and validation.
2. **If a technology consists of various sub-technologies, its TRL number is the lowest of all.** A technology may depend on a number of technologies or sub-systems with their own TRLs. Then, the ultimate technology is assigned with the lowest TRL number among them.
3. **When an element of a technology is altered, its previous TRL number becomes invalid.** When one replaces, eliminates, or adds a major component or part even in a TRL-9 technology, everything starts all over again from the appropriate TRL usually between 1-4.
4. **When the primary use of a technology changes, its previous TRL number becomes invalid.** If you try to integrate (launch) a technology (product) into a different system (market), you cannot claim its previous TRL number any more. You should work through TRL validations again.
5. **If a technology spends too much time at a given TRL, its TRL number becomes invalid.** As time goes by, even a TRL 9 technology requires re-confirmation due to the probable changes in the conditions (i.e. know-how, climactic environment) that its previous TRL number is based on.
6. **Activities and progress through TRLs are not time-boxed.** Some technologies may evolve faster than others. Or, a particular technology may pass some levels in weeks but the others in years.
7. **TRL activities and validation criteria are subjected to change over time.** You cannot precisely specify TRL 8 requirements for a project while you are at TRL 2 stage and keep them the same along the way. Inspection and adaptation are needed.

Important terms to know when using the technology readiness level index include:

1. **Prototype:** A physical or virtual model used to evaluate the technical or manufacturing feasibility or utility of a particular technology or process, concept, end item, or system.
2. **Model:** A functional form of a system, generally reduced in scale, near or at operational specification. Models can be sufficiently hardened to allow demonstration of the technical and operational capabilities required of the final system.
3. **Demonstration/pilot:** Actions aiming to validate the technical and ecological viability of a new or improved technology, product, process, service or solution in an operational (or near to operational) environment.
4. **Critical technology element:** A new or novel component that a technology or system depends on to achieve successful development or to successfully meet a system operational threshold requirement.
5. **Relevant environment:** Testing environment that simulates the key aspects of the operational environment.
6. **Operational environment:** Environment that addresses all of the operational requirements and specifications required of the final system, including platform/packaging.

A complete technology readiness level (TRL) may also contain the following additional information:

1. Technology name.
2. Technology material composition.
3. Technology material configuration.
4. Technology operational usage requirements.
5. Technology safety requirements.
6. Video of technology in use.
7. Alternative technologies.

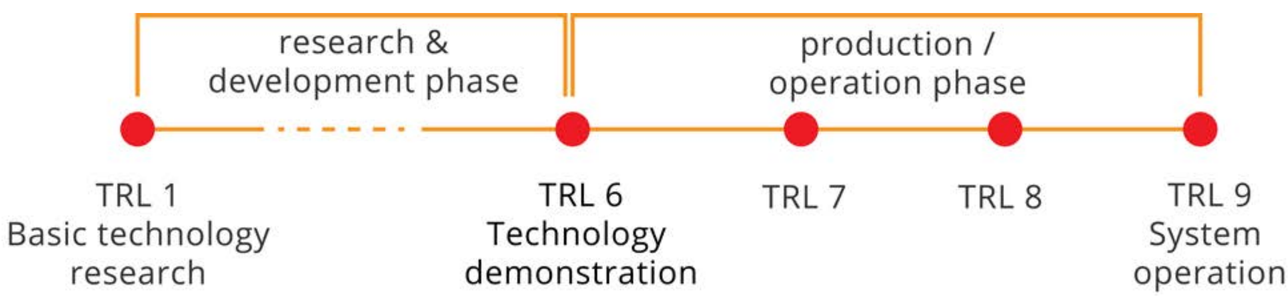

Figure 32. *Technology readiness level production/operation phase.*

2.3 Technology obsolescence levels

The general technology obsolescence levels are:

1. Obsolescence not an issue.
2. Technology is the state-of-the practice; emerging technology could integrate or replace.
3. Technology is outdated and use should be avoided in new systems; spare parts supply is scarce.

In industry, technology primarily becomes obsolete when another technology becomes more cost effective for the functionality provided -- emerging technologies compete with established technologies for market share over a particular [service] functionality. In community, new discoveries and engineered systems render old technologies obsolete.

2.4 Technology market readiness levels

In a market, along with technology readiness there is also something called a, market readiness level (MRL), which refers to peoples' desire and financial resources to purchase a technology (i.e., the readiness of people to consume the technology).

2.5 Technology phasing and the infrastructure problem

The issue of phasing technology into a societal system is often called, "the infrastructure problem".

3 Technical unit(s) accounting

A.k.a., Technological unit, technical unit as a resource accounting, production units, technical production unit, service production unit, production service unit, useful productive resource configurations, technology production accounting, technical production unit accounting, production accounting, technology unit accounting, technology units, etc.

'Technical units' are the single machine units of production. A group of technical units are often known as a plant, factory, production facility, production center, etc. All the technical units in a specified habitat service are the technical units in that particular economic sector (i.e., all the units in that sector of the habitat service economy).

CLARIFICATION: T*echnical units produce user units. For example, a tennis racket is a "user unit". The machine(s) that produces tennis rackets is a "technical unit".*

It is important to state first that economic units behave differently in different types of society:

1. In the market, economic units act competitively (competing economic units).
2. In community, economic units act cooperatively (cooperating economic units).

What is the unit of technical production (production unit, technical unit, economic unit, etc.)?

1. **[Habitat units] Production/technical units (economic units of production):** These are habitat units (the unified and master planned habitats themselves); habitat socio-technical unit as a production unit itself.
2. **[Service units] Intermediary technical units (a.k.a., means of production units, production units, service units):** These technical units (a.k.a., production units) produce the machines and processes that produce the end product.
   A. Habitat service unit categories:
      1. Life support service (safety).
      2. Technology support service (infrastructure).
      3. Exploratory support service (discovery).
   B. End access units are those used by the end user directly. These are end-user, life, technology, and exploratory service-objects accessed by a table of the following categories of user:
      1. Class:
         i. Team access.
         ii. Common access.
         iii. Personal access.
      2. Life-phase:

i. Nurturing.
ii. Education.
iii. Contribution.
iv. Leisure.

Considering the presence of technical production units, the resource inquiry becomes:

1. How much of each resource is in each technical unit?
    A. Estimate of mineral content for each technological unit?
        1. How much metal is in each technology unit?
    B. Estimate how much biological content there is for each unit.
2. What is the time required to develop, construct (and commission) the technical unit?
3. What is the human work required to develop, construct (and commission) the technical unit?
4. What is the human work required to continuously operate the technical unit?
5. How much of each resource does the technical unit use over the course of its life-span?
    A. How much fuel and/or flow is required for each technical unit to operate.
6. How much can be recovered from the technical unit after de-commissioning?

The power (energy) inquiry becomes:

1. How many technical units using power and/or operating via power are there?
    A. How many habitats are there?
        1. How many technologies and technical units are there per habitat service system?
            i. How many vehicle production technical units are there, for example?
                1. How many operable vehicles are there (cars, trucks, ships, planes, aeroplanes), for example?
2. All power uses a unit of input (object) calculated as "energy", of which there is stored (static) energy (i.e., fuel) and motion (dynamic) calculated energy (i.e., flow). What do classes of fuels and flows do for habitat service productions (technical unit operations)?
    A. What does combustion (hydrocarbon fuel) do?
    B. What do flow harnessers (wind and solar flow) do?
    C. What do gravity harnessers (damn flow) do?
    D. What do nuclear transition harnessers (fission and fusion flow) do?
3. How much (extra) electrical power capacity is needed to phase out the market-State entirely?
4. How many new power stations will be needed?
5. How many batteries will be needed?
6. How many solar panels will be needed?
7. How many wind generator turbines will be needed?
8. What quantity of minerals will be needed to do this?

Resources become integrated into technical units. A technical unit is a system that produces some intermediary deliverable for final user deliverable. Each technology unit has the following categories of data collection:

1. Class of production (of technical unit).
2. Capacity for production (of a technical unit of the productive class).
3. Energy efficiency rating of production (for the technical unit).
4. Number of units by type (currently doing production).
5. Materials:
    A. Integrated material types (material ID).
    B. Percentages of overall unit composition in percent.
    C. Recoverability of each material (per unit) in mass.
6. Sum total of each material for global fleet of technical units.
7. Metal content by type and mass per product deliverable unit; example, megawatt of power production per *x* metal of *y* mass (e.g., kg of copper per megawatt produced). What metal is needed to produce a single unit of a technical power production unit (e.g., wind turbine) per megawatt?
8. Total material required by class for starting (#1) technical units.
9. Total re-build/re-placement required by class for re-building/re-placing the starting (#1) technical unit when it wears out.
    A. Total material required by class for rebuilding starting technical units. Material resources are required to re-built the technical unit when it wears out over time. What resource replacements are necessary?
    B. Number of years between each rebuild. The material resources in a technical unit will wear out and need replacement after durations of time. When will resources need replacing; the re-build/re-placement is necessary every what number of years (and months, days, hours, seconds).

It is important to note here that no technical unit is renewable (like, "renewable" resources); instead, they are all only [necessarily] re-buildable, after their lifespan is complete. This means that the resources that go-into the technical units creation will have to be replaced (re-built) with new resources every set number of years.

In relation to the habitat, technical unit accounting includes:

1. Material quantity and quality required for the global fleet of technical units in the global habitat service system.
2. Material quantity and quality required for a regional network fleet of technical units (local habitat cluster).
3. Material quantity and quality required for a local fleet of technical units (single habitat only).

In relation to the habitat,

1. The number of habitats in the global habitat network.
   A. By production classification:
      1. The number of light productive habitats in the global habitat network.
      2. The number of heavy production habitats in the global habitat network.
   B. By life-phase classification:
      1. The number of work-life phase habitats (education & mentoring production) in the global habitat network.
      2. The number of leisure-life phase habitats (no production) in the global habitat network.

For example, if the technological unit class was electricity power production, then material content in different technical sub-units could include:

1. Material content in solar panels and solar panel production machinery.
2. Material content in wind turbine construction, operations, and maintenance.
3. Material content in geothermal plant construction, operations, and maintenance.
4. Material content in hydrological power plant construction, maintenance, and operations.
5. Material content in nuclear power plant construction, maintenance, and operations.

In concern to transportation, it is possible to estimate the total resources and power required to move a sufficient number of vehicles a sufficient distance (km) to meet the transportation requirements of the global habitat service system:

1. The travelable distance for a given battery/fuel-tank capacity.
2. The number of vehicles and their size - requirements for battery/fuel-tank, motors, and container.
3. Estimated kilometer distance all vehicles will travel in a year.
   A. If combustion, how much hydrocarbon fuel.
      1. If it was able to consume a specific amount of power per kilometer, how much hydrocarbon combustion power would be required to do that.
   B. If hydrogen, how much hydrogen fuel.
      1. If it was able to consume a specific amount of power per kilometer, how much hydrogen conversion power would be required to do that.
   C. If electric, how much charge time.
      1. If it was able to consume a specific amount of power per kilometer, how much electric power would be required to do that.

It is necessary to compare technical unit sub-types to identify (to do the same amount of work, one system must use what materials at what rate with what recoverability amount:

1. What materials are entered into a fixed composition?
2. What materials are used as fuel?
3. What materials are used for maintenance?
4. What materials are recoverable?
5. What is produced for the configuration and ratio of minerals?

Technical unit decision accounting, involving sustainability ought to at least consider whether:

1. Production can be structured around master plans of the number of technology units required to meet human demand.
   A. Are there an unnecessarily large amount of technology units; can the number be reduced?
2. Production can be built around a smaller number of components (genre components), produced from a less complex materials feedstock.
   A. Would this would necessitate accepting a reduction in performance metrics?
3. Production can prioritize feedstock produced locally/regionally as opposed to globally?

Hence, for comparison, it is possible to look at three technical power production units and compare:

1. Technology unit type 1 (e.g., flow harnessing electricity production).
   - ...
2. Technology unit type 2 (e.g., hydrogen fuel electricity production).
   - ...
3. Technology unit type 3 (e.g., hydrocarbon fuel).
   - ...
4. Mix of technology type 1, 2, & 3.
   - ...

For example,

1. How many solar panels will be required?
2. How many wind turbines will be required?
3. How many hydro turbines will be required?
4. How many new nuclear power plants will be required?
5. How many metal-ion (e.g., li-ion) batteries will be required?
6. How many hydrogen fuel cells (power cells) will be required?
   A. How much hydrogen will be required?
7. How many combustion motors will be required?
   A. How many hydrocarbons will be required.
   B. How much biofuel will be required?
8. And, what quality of minerals and manufacturing facilities will be required?

Will will the other habitat service systems be powered:

1. How will buildings as architecture be powered?
2. How will vehicles as architecture be powered?
3. How will temperature changes be powered?
4. How will chemistry be powered?

3.5.1 Technical unit life cycle

Every technology (technical unit) has a life-cycle. The manufactured last-ability of the system. How long will the construction lasts before needing significant replacement? At which point they have to be de-commissioned and replaced. The average last-ability figure for most technical production units is between 8 to 25 years, after which time they must be de-commissioned and replaced with the same, or a more advanced generation of technical units. If economic calculation can account of a known number of technical units coming offline for de-commissioning, and it was known what was in them, then if they are put through recycling systems, how much could actually be recycled for re-use in another technical unit. What percent can be recycled back into a new technical unit. This shows the relationship between mining and recycling. Some material will be more capable of being recycled than others.

4 Technical unit automation sub-inquiry

I.e., Technical unit automation (as an efficiency objective) protocol/inquiry.

All automation requires technology, which requires physical (and computational) resources. Some physical motions can be automated, and others cannot. All software is a form of automation; the automation of computation.

4.1 Automation benefits

Technological productivity can be calculated as:

- Productivity = what is produced / # of hours it takes to produce.

4.2 Automation inquiry

In concern to automation, there are two dimensions given the context of the use of a technology (intermediary product) used to producer service-objects (final product):

1. Is it possible to automate the service?
   A. Is there sufficient technology (tools) and energy (power) to automate the service?
2. Is it desirable to automate the service?
   B. Are there humans that desire to do the service?

The above inquiries lead to the following question and resolutions: Can the service be automated? If it cannot, and

1. it is not an essential service, and
   A. there is no one willing to perform maintenance on the service, then
2. the implementation of the service will need to wait until either:
   A. There are individuals willing to perform the work, or
   B. there is an automation system that can perform the work.

Take for example, a grassed area (regardless of the non-life support purpose for which it is desired existence); if no one is going to mow the grass and no automation system exists to mow the grass, then the grass area will not exist, or it will be left as it naturally is/was.

Automation is defined as:

1. The use of certain methods for automatically producing and transporting objects, for processing information, and for making calculations, without human involvement.

2. Operating and directing technical system by other technical system that control the flow of information and material.
3. Automation is the process of developing and using machines that perform tasks without the necessity for human involvement.

There are forms of automation, and significant models and terminology therein:

1. **Human-automation interaction (HAI) model** - the interaction of humans with autonomous systems is primarily concerned with control as an operative function performed by humans and/or machines among automated systems.
2. **Human-in-the-loop model -** a model that places humans directly in the automation [algorithm] at key points.
3. **Human supervisory** or **monitoring model** - a model that positions humans in a supervisory or monitoring role over an automated system. In some cases humans must maintain situational awareness over the autonomous systems, and in other cases they do not.
4. **Semi-autonomous model** - a system that is semi, but not completely, autonomous such that it still requires manual human effort or control to function fully. For instance, where agent systems are able to perform complex tasks in complex environments with minimal supervision, but not no supervision.
5. **Fully autonomous model (a.k.a., full autonomy, fully autonomous)** - a system that excludes humans entirely, or places humans in the role of monitoring the autonomous system. Note, a fully autonomous intelligence will have the three autonomy abilities:
   A. Self-directing - taking decisions (without force or coercion), based on self-selected and self-set goals and objectives. This is always done within the bounds of a decisions system/framework.
   B. Self-correcting - detecting and rectifying tactical, strategic, logical and technical errors and flaws (of all recognizable kinds).
   C. Self-improving - capable of improving all layers of its stack (physical, mental, and models).

More simplistically, there are 4 automation categories that an economic product can be designated as. These designation categories concern the conditions under which something is being automated:

1. Automated without human supervisory control and self-sustaining (i.e., full automation, no human effort required, "automated automation").
2. Automated with human supervision control and self-sustaining (i.e., human must be present to monitor operation, partial automation).
3. Automated with human supervision control and not self-sustaining (i.e., human must be present to participate in operation, mechanization).
4. Low/no autom*ation* (i.e., human primarily operates, manual).

The terms automation and robotic can be defined and combined:

1. **Robotic** - An entity that has the capability to mimic the human actions.
2. **Process** - A sequence of steps, that lead to meaningful activity or task.
3. **Automation** - Tasks happen automatically (i.e., without human intervention).
4. **Robotic + Process + Automation** - Mimicking human behavior to execute a sequence of steps that lead to a meaningful activity without human intervention.
5. **Robotic process automation (RPA)** - A technology to configure computer systems to emulate manual tasks to automate processes; a robot that mimics interaction of humans with digital systems.

Whereas the brain is a consciousness processing device. A robot is a mechanical device that uses purely electronic processing to navigate its way around its world. The behavior of robots is preconfigured; they can't intend anything, they can only do. Robots are optimal for reoccurring, undesirable, and/or unsafe [human] tasks.

To human InterSystem Teams, the requirements of an automated information system include, but are not limited to:

1. User-computer interaction should provide the required information in an appropriate format.
2. Visual consistency should be provided.
3. Intuitive (i.e., easy-to-learn, easy-to-use) actions or commands that do not require significant memorization should be designed.
4. Escape, cancel and abort functions for all user actions should be allowed.
5. All information that the user requires to perform the task should be provided. Do not display extraneous information, but allow easy and direct access to more detailed information.
6. Make consequences of user actions across displays consistent. Provide distinctive, meaningful abbreviations and acronyms.
7. Prototype systems, and allow users to review them and provide feedback.
8. Design the interaction so the users can concentrate on the task, not the system.

To human InterSystem Teams, the defining characteristics of the operation of a decision support system include, but are not limited to:

1. Users can easily monitor a fully autonomous system during normal operations.
2. Human skill and reasoning can supersede or completely replace autonomous functions during anomalies.
3. System automation reduces demands on InterSystem teams, but still permits user interaction with the system.
4. System augments human sensory systems, mapping critical new data point an intuitive fashion.
5. System compensates for natural limitations on human sensory bandwidth by processing and filtering data before displaying data points that require intersystem intervention.
6. Interfaces are very fluid and respond to changing conditions, allowing system ton act as a human-multiplier when needed.

To human InterSystem Teams, the requirements of an automated information technology system include, but are not limited to:

1. **Autonomous science** - since science provides the primary underling purpose for exploration, some science will be conducted autonomously. Humans and IT system s may forge collaborative teams, with autonomous intelligent systems extending an Intersystem means reach and visibility. In advanced It systems, the level of scientist/system interaction will change, with the team providing high-level direction and the automated systems making basic decisions, planning, and executing the plan, and carrying out much of the data collection and analysis.
2. **Automated operations** - Information technology systems enable the automated control of complex systems that support a human population, such as environment control, life support, and in-situ resource and production .
3. **Human amplification** - The fundamental human capabilities of the individual will be "amplified" or enhanced through information technology. This capability could be extended to areas, such as hazard identification and avoidance.

INSIGHT: *The move from "laborer" and "employee" to "contributor" and "user" is change that has the potential to heighten degrees of self-determination among a social population, and is brought on by the development and adoption of autonomous systems. In the early 21st century, most people outsource nearly everything in their lives to oblivious, obscure and institutionalized systems that perpetuate scarcity and servitude, and yet, they still fear automation.*

4.3 Automation and InterSystem habitat service tasking

Tasks are divided between InterSystem Teams and Automated Systems in a way that maximizes the desires of humans and the skills and abilities of each. The default is that human users choose what they need, want and prefer as economic access, the required tasks are visible, and they choose to contribute to those tasks that are desirable, and then, automate therefrom.

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TABLES

Table 11. *Technology readiness levels 1-9 with descriptions.*

Number	Technology Readiness Level	Description
1	Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into technology's basic properties.
2	Technology concept and/or application formulated	Invention begins. Once basic principles are observed, practical applications can be invented. The application is speculative and there is no proof or detailed analysis to support the assumption. Examples are still limited to paper studies.
3	Analytical and experimental critical function and/or characteristic proof of concept	Active R&D is initiated. This includes analytical studies and laboratory studies to physically validate analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative.
4	Component and/or breadboard validation in laboratory environment	Basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity"compared to the eventual system. Examples include integration of "ad hoc" hardware in a laboratory.
5	Component and/or breadboard validation in relevant environment	Fidelity of breadboard technology increases significantly. The basic technological components are integrated with reasonably realistic supporting elements so that the technology can be tested in simulated environment. Examples include "high fidelity" laboratory integration of components.
6	System/subsystem model or prototype demonstration in relevant environment	Representative model or prototype system, which is well beyond the breadboard tested for level 5, is tested in a relevant environment. Represents a major step up in a technology's demonstrated readiness. Examples include testing a prototype in a high fidelity laboratory environment or in a simulated operational environment.
7	System prototype demonstration in an operational environment	Prototype near or at planned operational system. Represents a major step up from level 6, requiring the demonstration of an actual system prototype in an operational environment. Examples include testing the prototype in a test bed aircraft.
8	Actual system completed and qualified through test and demonstration	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this level represents the end of true system development. Examples include developmental test and evaluation of the system in its intended weapon system to determine if it meets design specifications.
9	Actual system proven through successful operations	Actual application of the technology in its final form and under mission conditions, such as those encountered in operational test and evaluation. Examples include using the system under operational mission conditions.

Table 12. *Technology readiness levels with description, requirement, verification, and viability.*

Applications	Technology Readiness Level	Description	Requirement	Verification	Viability
Broad Range of Applications	1	1.1) Physical Principle	1.2) Needed Capability	1.3) Analytical or Experimental	N.4) Advancement to the Next Level Technical & Programmtics (N = 1-8)
	2	2.1) Basic Concept	2.2) Needed Functionality	2.3) Analytical or Experimental	
	3	3.1) Key Technology Characteristics	3.2) Basic Requirements (Family)	3.3) Simulation or Experimental	
	4	4.1) Full Technology (in the Laboratory)	4.2) Complete Requirements (Narrower Range and Interactions)	4.3) Rigorous Experimental	
Family of applications	5	5.1) Full Technology & Interactions (in a Relevant Environment)	5.2) Complete Requirements (Specific)	5.3) Rigorous Testing at Component and/or Breadboard in Relevant Family of Environment	
	6	6.1) Full Technology in System or Subsystem	6.2) Full Requirements (System or Subsystem)	6.3) Rigorous Testing at System and/or Subsystem in Relevant Environment	
Preliminary Definition for Specific Application	7	7.1) Full Technology in System or Subsystem	7.2) Full Requirements in Space Environment (System or subsystem)	7.3) In Space Demonstration	
Specific Application	8	8.1) Full Technology in System (Manufactured)	8.2) Full System and Qualification Requirements	8.3)Qualification Campaign	
	9 (Application)	9.1) Final Manufacturing & Operations Plans	9.2) Performance and Manufacturing Requirements	9.3) System Operations Verification (including life)	9.4) Failure Analysis (if needed) and/or Future

TABLES

Table 13. *Technology readiness level index with definition, description, and results from.*

Application	Technology Readiness Level	Definition	Description	Results from
Pre-existing knowledge	1	Basic principles observed and reported	Lowest level of technology readiness. Scientific research begins to be translated into applied research and development (R&D). Examples might include paper studies of a technology's basic properties.	Published research that identifies the principles that underlie this technology. References to who, where, when.
Technology research	2	Technology concept and/or application formulated - conceptual design formulated	Once basic principles are observed, practical applications can be designed (i.e., "invented"). Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are limited to analytic studies. The step up from TRL 1 to TRL 2 moves the ideas from pure to applied research. Most of the work is analytical or paper studies with the emphasis on understanding the science better. Experimental work is designed to corroborate the basic scientific observations made during TRL 1 work.	Publications or other references that outline the application being considered and that provide analysis to support the concept.
Research to prove feasibility	3	Analytical and experimental critical function and/ or characteristic proof of concept - conceptual design tested analytically or experimentally "Concept defined"	Active research and development (R&D). This includes analytical studies and laboratory studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated or representative. At TRL 3 the work has moved beyond the paper phase to experimental work that verifies that the concept works as expected on simulants. Components of the technology are validated, but there is no attempt to integrate the components into a complete system. Modeling and simulation may be used to complement physical experiments.	Results of laboratory tests performed to measure parameters of interest and comparison to analytical predictions for critical subsystems. References to who, where, and when these tests and comparisons were performed.
Technology development	4	Component and/ or system validation in laboratory environment - critical function/characteristic demonstration "Concept defined"	Basic technological components are integrated to establish that they will work together. This is relatively "low fidelity" compared with the eventual system. TRL 4-6 represent the bridge from scientific research to engineering. TRL 4 is the first step in determining whether the individual components will work together as a system.	System concepts that have been considered and results from testing laboratory-scale. Reference to who did this work and when. Provide an estimate of how test results differ from the expected system performance goals.
Technology development	5	Component and/ or system validation tested in relevant environment "Proof of concept validated"	The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a simulated environment. The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. The major difference between TRL 4 and 5 is the increase in the fidelity of the system and environment to the actual application. The system tested is almost prototypical.	Results from testing are integrated with other supporting elements in a simulated operational environment. How does the "relevant environment" differ from the expected operational environment? How do the test results compare with expectations? What problems, if any, were encountered? Was the system refined to more nearly match the expected system goals?

TABLES

Application	Technology Readiness Level	Definition	Description	Results from
Technology demonstration	6	System/subsystem model or prototype demonstration in relevant environment - prototype/engineering model tested in relevant environment "Proof of concept validated"	Engineering/pilot-scale, similar (prototypical) system validation in relevant environment. Represents a major step up in a technology's demonstrated readiness. Representative model or prototype system, which is well beyond that of TRL 5, is tested in a relevant environment. TRL 6 begins true engineering development of the technology as an operational system. The major difference between TRL 5 and 6 is the step up from laboratory scale to engineering scale and the determination of scaling factors that will enable design of the operating system. The prototype should be capable of performing all the functions that will be required of the operational system. The operating environment for the testing should closely represent the actual operating environment. Examples include testing a prototype in a high-fidelity laboratory environment or in a simulated operational environment.	Engineering-scale models or prototypes are tested in a relevant environment. Results from engineering scale testing of a prototype system that is near the desired configuration in terms of performance, weight, and volume. How did the test environment differ from the operational environment? Who performed the tests? How did the test compare with expectations? What problems, if any, were encountered? What are/were the plans, options, or actions to resolve problems before moving to the next level?
System integration	7	System prototype demonstration in relevant operational environment - engineering model tested under relevant operational conditions "Demonstrated"	Prototype near (or at) planned operational system. A similar (prototypical) system is demonstrated in a relevant operational environment. Represents a major step up from TRL 6 by requiring demonstration of an actual system prototype in an operational environment.	Results from testing a prototype system in an operational environment. Supporting information includes results from the full-scale testing and analysis of the differences between the test environment, and analysis of what the experimental results mean for the eventual operating system/environment. Who performed the tests? How did the test compare with expectations? What problems, if any, were encountered? What are/were the plans, options, or actions to resolve problems before moving to the next level?
	8	Actual system completed through testing in an operational environment "Qualified"	Technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents The technology meets its designed specification.	Results of testing the system in its final configuration under the expected range of environmental conditions in which it will be expected to operate. Assessment of whether it will meet its operational requirements. What problems, if any, were encountered? What are/were the plans, options, or actions to resolve problems before finalizing the design?
System operation	9	Actual system operated successfully through expected conditions "Proven"	The technology is in its integrated form (i.e., integrated into a service system) and operating under the full range of expected conditions, such as those encountered in operational test and evaluation (OT&E).	OT&E data.

TABLES

Table 14. Automation*: Alignment of level of robotic automation (involving decisioning and independent executability) with human autonomy.*

Level Of Robot Decisioning ("Moral Agency")	Sheridan's Autonomy	Level Of Autonomy
No robot decisioning (No moral agency)	Machine/computer offers no assistance; human does it all.	Level zero: No automation.
No robot decisioning (No moral agency)	Machine/computer offers a complete set of action alternatives (*information only*).	Level one: User assistance.
Robotic analytical support processing (Implicit moral agent)	Computer narrows the selection down to a few choices.	
Robotic analytical decisioning (Implicit moral agent)	Computer suggests a single action.	
Robotic execution approval (Implicit moral agent)	Computer executes that action if human approves.	Level two: Partial automation.
Robotic execution override (Implicit moral agent)	Computer allows the human limited time to veto before automatic execution.	
Robotic execution (Explicit moral agent)	Computer executes automatically then necessarily informs the human.	Level three: Conditional automation.
Robotic execution status (Full moral agent)	Computer informs human after automatic execution only if human asks.	
Robotic execution priority (Full moral agent)	Computer informs human after automatic execution only if it decides to.	Level four: high automation.
Full robotic execution automation (Fully moral agent)	Computer decides everything and acts autonomously, possibly accepting or not human input in decisioning.	Level five: full automation.

Table 15. Automation*: Service production automation types.*

Operational Service	Production Service	Automation Service
Service	Continuous Production	Auto without human & Self-sustaining Automated Automation (AA)
Service Components	Continuous Structure	Auto with human & Self-sustaining Hight Automation (HA)
Operational Systems	Ad Hoc Production	Auto with human & Not self-sustaining Moderate Automation (MA)
Hardware	Ad Hoc Structure	Low / No Automation (LA / NA)
System Software	Cyclic Production	
Application Software	Cyclic Structure	

Resource Inquiry Accounting

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Abstract

All socio-technical platforms must account for resources. When engineering anything, its object composition, and the composition of the environment where objects are distances from one another, must be accounted for. Resources are one necessary element for which to account when planning a project and operationalizing a product. Resources are accounted for through a global resource survey. In the market, resources are property. Spatial resources (true resources) are objects (i.e., made of matter/shape). Informational "resources" (digital resources) are data (i.e., made of bits). Human "resources" (contributors) are individuals (i.e., made of consciousness). Consciousness uses spatial and informational resources in order to sustain its embodiment and to develop itself.

Graphical Abstract

Image Not Yet Associated

1 Resource accounting and inquiry

NOTE: *A failure to plan for resource use can be oppressive, if not fatal to individuals and the planet.*

Daily activities in a habitat involve resource movements (i.e., the movement of objects in and through habitats, and therein, through peoples' usage/consumption). Resource Inquiry represents the continuous process of accounting for [the qualities and qualities of] common heritage resources (materials) by surveying the habitat for all their existence in real-time (when possible). This general process is known as **resource accounting** and it is an inquiry into the resources themselves: their qualities and quantities; their location (and proximity to need); and their strategic availability. There exists an [systems] environment of resources that may be accounted for. This inquiry involves a system of teams and information sensors (detectors and instruments) with the purpose of monitoring and tracking the location, consumption and regeneration rates, and the trending availability of resources. Resources are a physical referent and a calculable source of information (e.g., a community can calculate the most abundant mineral with the greatest conductivity for a particular engineering purpose). The qualities of resources must be defined if they are to be accounted for accurately in our information system. During the resource inquiry process ‘resource surveys’ lead to ‘resource inventories’ that represent the available resources for fulfillment of the community’s needs. The resource inquiry process determines the **availability** of a resource through a continuous global-community surveying of resources. Resources are transformed and transported.

A simplistic view of the resource accounting system is:

1. What resources are required?
2. What resources are available?
3. What resources will be or should be available?

It is essential to monitor resources appropriately as they move through the habitat as:

1. Raw resources.
2. Intern assembled product ("means of production").
   A. Assembles final production products.
3. Final assembled user product (habitat|personal / common) for the different sectors of the economy/ habitat.
   A. Final product.

If resources are to be applied toward the efficient and responsible (i.e., sustainable) lifecycle of goods and services, then an accurate accounting of resources is a requirement. If the community does not know what resources it has, then how can the community take commonly agreed upon action? How will it achieve Strategic Access to goods and services? Only after a community has an *accurate account* of resources and information pools, then it can begin arriving at *accurate* economic decisions (i.e., this is a basis of a resource-based economy). Hence, decision alternatives (and actions) become available only when their corresponding resources are known and available. In other words, tasks become viable when their required resources are available.

This is an inquiry into the **resource availability** of a solution’s resource requirements. Here, the rates of resource usage and regeneration are tracked and trended to remain in a state of dynamic equilibrium with our environment. If resources are consumed faster than they are regenerated, then the system is functionally unsustainable. A sustainable community must know, at least:

1. What options are available with the resources that are available? What are the possibilities for using the resources currently available?
2. Have different plans been developed to show alternative usages for the available resources?
3. What plans for resources are being developed simultaneously?
4. What resources are required?
5. What are the substitutable resources?
6. What resources are available?
7. What resources will be available?
8. When will resources be available?
9. What are the qualities of the resources?

Nature, the Earth, is a finite and increasingly knowable sum. Unless we conserve the planet there isn’t going to be any “the economy”. Nature provides all kinds of services that are essential to the planet and to our survival. These services and their total relationship in an ecological system must be accounted for in any valid economic system. Such services are not “externalities”, they are “essentials”.

Resources and their usage when handled improperly by a civilization can culminate in some large problems despite technological advancement. In community we do not structure the flow of our material resources into “waste dumps” and “trash tips”. Once again it must be said that, a system is what it does, not what we want it to do. If a system produces an accumulation of waste, then it is doing so through a [constructed] design.

We exist in some form of symbiotic relationship with our natural environment. This is an essential understanding for a community of humans driven toward a more meaningful purpose, their betterment. We exist in an interrelationship with the many [symbiotic organisms that inhabit Earth] from which our community is derived through availability and access to resources.

The resource inquiry system functions to:

1. Account for common heritage resource by recognizing their Habitat System's allocation, their access designation, and their location. Where is the resource located?
2. Identify what effort of expenditure will be required to transport the resource to where it is required? This question involves the field of study and inquiry known as [energy] 'logistics'.
3. Identify the [comparative] qualities of each resources?
4. Identify whether a particular resource meets the qualities required of it by the solution design?
5. Identify the 'condition' of the resource? This may require a resource analysis to determines its conditions.
6. Identify the regeneration periodicity and rate of consumption, which are both necessary in the calculation of dynamic equilibrium. This information provides trending data and informs predictability.
7. Identify whether the resource is available or unavailable and when it will become available and with what degree of certainty.
8. Identify when the resource will become available.
9. Identify where the resource will become available.
10. Identify alternative resources with similar or improved qualities.
11. Identify the continued operational resource cost required by the currently operational solution?
12. Identify the 'steady state' or 'dynamic equilibrium' where the environmental conditions of needed resources are held more or less constant by negative feedback systems operating within the ecosystem. A state of dynamic equilibrium may be optimally maintained through real-time electronic feedback [sensory] instruments used to monitor the priority of urgently needed resources.

In the Community, all common heritage resources are logged, tracked and accounted for via the **resource accounting system**. The Resource Accounting System includes, but is not limited to, the activities of classification (e.g., attributes & qualities), location, designation, regeneration and consumption rates, and availability data. The Resource Accounting System monitors the trending of resources. Here, it is recognized that systems that require fewer resources for the same level (or quality) of output are increasing in their efficiency [in context].

Resource regeneration must never dip below what is sufficient for each Habitat system to maintain a state of dynamic equilibrium. Not doing so puts the very survival of our community at risk.

> **NOTE:** *Once humanity began to interact on a global scale, then the entire global ecology necessarily comes into focus. And, once humanity begins to share on a global scale, then the entire global community necessarily comes into focus.*

1.1 User resource accounting

All global users must be accounted for within the decision system. Herein, it is relatively possible to account for, track, and relatively predict how much of each resource each person will consume from before they are born until they die.:

1. Relative resource consumption per person per year of lifetime.
   A. An individual's resource usage and occupation over their lifetime.
2. Total consumption over the lifetime of a person for a resource.

1.2 Material-resource typing

Resources are made/composed of materials. Resources can be classified according to the type of matter, its rarity (on the planet) and acquisition complexity:

1. **Mineral resources:**
   A. **Inorganic mineral resources (non-carbon mineral resources).**
      1. Rarity on planet.
         i. High rarity.
         ii. Low rarity.
      2. Acquisition complexity (including energy input necessary):
         i. High energy requirements.
         ii. Medium energy requirements.
         iii. Low energy requirements.
   B. **Organic mineral resources (carbon-mineral resources).**
      1. Rarity on planet.
         i. High rarity.
         ii. Low rarity.
      2. Acquisition complexity (including energy input necessary):
         i. High energy requirements.
         ii. Medium energy requirements.
         iii. Low energy requirements.
2. **Non-mineral resources (biological resources):**
   A. **Living biological matter.**
      1. Rarity on planet.
         i. High rarity.
         ii. Low rarity.
      2. Acquisition complexity (including energy input necessary):
         i. High energy requirements.
         ii. Medium energy requirements.

iii. Low energy requirements.

B. **Dead biological matter.**
   1. Rarity on planet.
      i. High rarity.
      ii. Low rarity.
   2. Acquisition complexity (including energy input necessary):
      i. High energy requirements.
      ii. Medium energy requirements.
      iii. Low energy requirements.

Resources may also be broadly categorized according to their inertness (i.e., their non-reactivity to electromagnetism and fission):

1. **Living organisms (i.e., biotics, organic, life).**
2. **Mineral elements.**
   A. **Inert materials (not EM interfaceable and not fissionable, inert minerals):** are substances that are chemically inactive or resistant to chemical reactions under specific conditions.
   B. **EM interfaceable material (i.e., electromagnetic materials, conductors and semi-conductors, EM minerals):** are substances that possess properties suitable for interacting with the "light" along the ropes that inter-connect all atoms.
   C. **Fissionable materials (i.e., radioactive materials):** are substances capable of undergoing nuclear fission, a process where the nucleus of an atom splits into smaller parts, releasing a tremendous amount of energy.

> **NOTE:***The whole human population lives in a world where electrical machines do a significant amount of the necessary work; and, all the machines require power as well as minerals.*

1.3 Material-resource surveying

A resource is any useful object (including the service as an arrangement of objects) that produced that object. All resources can be surveyed and statistically analyzed. A global resource survey must be conducted to appropriately account for that which is available to construct. By accounting for resources and engineered habitat service designs, it is possible to optimally plan for human need fulfillment. Here, all possible resources have physical locations, quantities, and qualities.

The surveying of resources occurs via multiple different mediums through the material existence of the habitat system. Some of the [proximity] surveying (sensor) instruments are automated, and other surveying instruments require manual input. Notably, we as individuals can share our observed record of the availability of a resource in a particular location; and when we coordinate at scale we can also perform this function at scale. Bees are known to communicate resource availability information, and we call their communication a "waggle dance". Resource surveying in community naturally includes our shared surveys of our environment through a common linguistic interface.

For manual purposes the community uses input survey devices (or proximity survey sensors) in spatial location so that users and caretakers can input their observations of the area in some high degree of real-time (i.e., while they are still in the area).

> **INSIGHT:** *Every time a resource allocating system allocates a specific resource to a person (allocatable identity), this changes the system. And, the actions of the individual person (allocatable identity) also affect the future state of the whole resource system.*

Technically, anything (i.e., any object) being used in service and/or as part of the composition for another thing (i.e., another object) is a resource. All functional systems are composed of objects as 'resources' -- technologies are composed of resource, the planet is composed of resources, and living things are composed of resources. Effectively, any material (physical) thing (Read: object) could be a resource.

> **MAXIM:** *When you know what resources you have, then you know what actions you can take.*

A global resource survey must account for resources globally, and classify them appropriately to a humane standard of human need fulfillment:

1. What are the types of resource.
2. What land is available and at what purity and quality?
3. What chemicals are available and at what purity and quality?
4. What materials for production are available and at what quality?
5. What are the productive technologies and what are they composed of?
6. How are the productive technologies organized to service human need fulfillment (in a habitat)?
7. How are the deliverables of the productive technologies used?
8. What is recoverable at the end? What is recoverable after the resource has been fully used?

> **NOTE:** *In the market-State, resources are typically traced/ogged by means of a Certificate of Authenticity (CoA; a legal record). A certificate of authenticity is a document guaranteeing the authenticity of a resource and allowing (to some degree) the history of the resource to be tracked.*

1.3.1 Resource readiness quality level (RRQL)

A.k.a., Resource readiness level (RRL), resource *sustainability levels (RSL).*

There is not a widely recognized or standardized Resource Readiness Level (RRL) system analogous to the Technology Readiness Level (TRL) system used to assess the maturity of technologies. However, it is possible to assess the readiness or maturity level of resources, especially in the context of sustainability, circularity, and resource efficiency. In these contexts, factors such as the availability and environmental impact of extracting and using certain resources could be evaluated through a readiness level framework. Elements that could be assessed in a Resource Readiness Level framework might include (note: RRL analysis connects resource inquiry to the environmental assessment inquiry):

1. **Availability:** The abundance or scarcity of a resource and the ease of accessing it.
   A. Indicator: Geological abundance.
   B. Metrics: Reserves-to-production (R/P) ratio, geographical distribution.
2. **Extraction impact:** The environmental and social impacts associated with extracting the resource.
   A. Indicator: Environmental degradation.

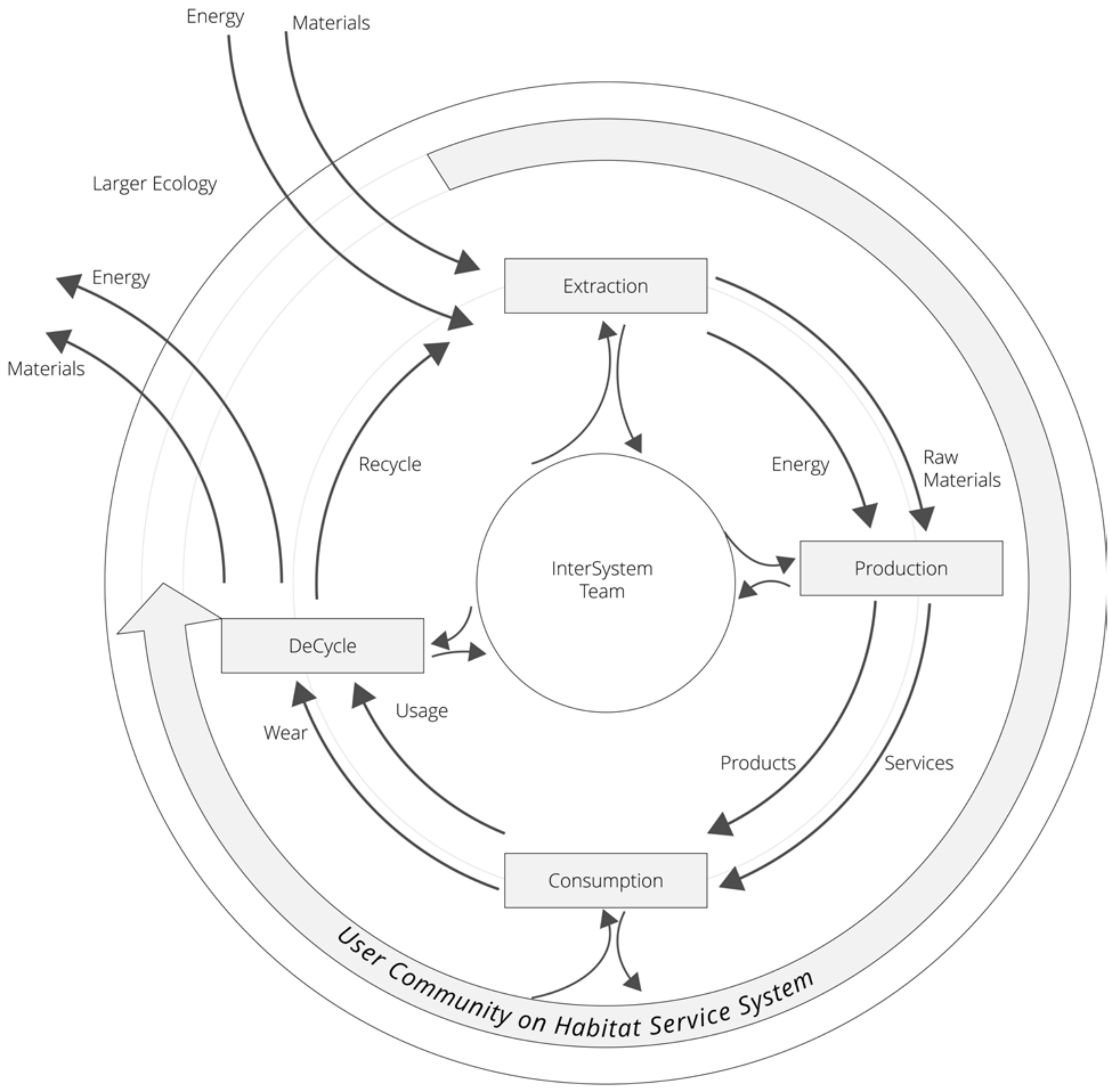

Figure 33. *The engineering of a real-world material cycle of resources for human "consumption" through team contribution.*

   B. Metrics: Habitat disruption score, water usage, CO_2 emissions per unit extracted.
3. **Processing and manufacture:** The energy and resources required to process and manufacture products from the raw resource.
   A. Indicator: Energy and resource intensity.
   B. Metrics: Energy consumed per unit processed, waste generated per unit product.
4. **Recyclability and reusability:** How easily the resource can be recycled or reused, including considerations of quality loss and economic feasibility.
   A. Indicator: Lifecycle sustainability.
   B. Metrics: Percentage of material recyclable or reusable, quality retention rate after recycling.
5. **Substitutability (a.k.a., alternatives):** The ease with which the resource can be substituted with a less impactful alternative.
   A. Indicator: Alternative material viability.
   B. Metrics: Performance comparison index with substitutes, economic cost ratio of substitute materials.

All resources are listed in a resource assessment table that identifies:

1. Resource name (material name).
2. Sources of each resource/material.
3. Extraction, processing and manufacturing methods (techniques) for each resource/material
4. Environmental and safety data sheet (MDS) for each resource/material.
5. Alternatives and substitutes [for each resource/ material].

1.4 Material-resource inquiring

From a materials science perspective, the process of materialization involves the “call” of [factual] information from the following categories associated with a resource:

1. **Statistical certainty call:** Science provides certainty.
2. **Resource location call:** Objects as "resources" have real-world, physical, existent locations and occupations.
3. **Physical experiments call:** Materials have properties.
4. **Material composition call:** Materials may be combined into material compositions to change the expression of [material] properties.
5. **Potential assembly call:** Material compositions may be connected to perform technical functions as a technology module.
6. **System call (a.k.a., Service call):** Material configurations [as technology modules] may be integrated into service through a service system.

1.5 Material-resource integrity

A.k.a., Material continuity.

Due to the entropic nature of material reality, all material that is formed into an intend functional system has a state of functional integrity (material change impacts function) and non-functional integrity (material change does not impact functionality).

1.5.1 Surfaces

A.k.a., Geometric surface.

Surfaces need to be carefully selected. Take a painted building for example. Would you rather see the buildup of “dirt” and get rid of it, or use a material that either did not allow for the buildup of dirt and/or did not show the buildup of dirt? Here, dirt is that which has been unintentionally added to or taken away from a surface (i.e., dirt is that which is out of place on a surface). So, dirt could be the buildup of particulate matter on a surface, or it could be deposits from the erosion/corrosion of the surface over time.

A surface has likely been selected because of its various properties. These properties are altered by dirt. Hence, the surface will need to be restored so that it is expressing the original properties desired of it, which may necessitate a [surface] **restoration cycle**.

> **NOTE:** *Losing function is losing the capacity to do something. As a space “wears”, its structure can lose its capacity to carry on its function.*

1.6 Material-resource societal integration

> **NOTE:** *Once a society builds past its causative environmental limits, then collapse becomes inevitable.*

There are at least four factors that facilitate a determination of the quality of a resource. These factors represent categorical information and form the acronym ‘SANE’. When we “bring in” a resource into our habitat service system we can evaluate it more accurately in terms of its following identifications:

1. **Saturation:** (1) How quickly the resource’s integration will fulfill the required need. And, (2) The predicted ‘lifespan’ of the resource; how long the resource is capable of fulfilling its functional purpose (i.e., remaining in the system in its intended function) before needing to be replaced, re-cycled and de-composed.
2. **Signaling [Aggression]:** How well the resources integration signals healthy functioning [capacity] and minimizes conflict, aggression, and dis-ease

in ourselves and the ecological environment. For example, putting lead in paint has the signaling impact of producing poorer quality functioning in those humans exposed to it, which may lead to a lower intellectual ability to coordinate decisive action, and thus, possibly increase social conflict. Also, for instance, foods that cause brain inflammation are more likely to result in the expression of physical aggression by the “inflamed” [neurophysiology of the] individual.

3. **Nutriment:** How many essential requirements (or needs) the resource is capable of fulfilling.
4. **Efficiency:** (1) The efficiency by which the resource can be regenerated, recycled, and decomposed. And, (2) how efficiently the resource moves through its service lifespan and is not converted into a “toxic” and unusable resource (i.e., “waste” product).

It may be of interest to note here that these four categorical factors for resource evaluation were taken and modified from the SANE acronym for calorie evaluation described in a book by Johnathan Bailor (2015) entitled, “The Calorie Myth: How to Eat More, Exercise Less, Lose Weight, and Live Better”. Bailor devised the acronym SANE to represent the four factors of calorie quality. Therein,

1. S = satiety: how quickly a calorie satisfies you and for how long.
   A. How quickly is a need met by society's socio-technical (a.k.a., socio-economic system)?
2. A = aggression: how quickly and severely a food causes your blood sugar to rise.
3. N = nutrition: the nutritional quality of the calorie, quality trumping quality.
4. E = efficiency: how efficiently the body processes the calorie.

1.7 Material-resource quality control

There are significant differences between quality control in industry and in community. These differences are socio-economic in nature. In industry, the quality control process is as follows: people create things for another group of people; another group of people review and assess the first people’s creations. In community, the quality control process is as follows: users openly and collaboratively create things for themselves while interfacing with a unified information model.

In industry, the outputs of processes must constantly be assessed and reviewed due to the presence of significant unknowns (i.e., due to the drive to conceal inputs, processes, and outputs for competitive advantage in the market). In community, the outputs of processes are significantly known due to the presence of a collaboratively developed, unified, and transparent information model. In community, inputs and processes and outputs are available for all to see, and for all to improve. In community, new outputs are tested prior to integration into the service system, whereupon they are tested again. And, once they are operational, we sense and otherwise monitor for signaled changes from the environment as feedback for improving and otherwise adapting (and evolving) our systems (i.e., our inputs, processes, and outputs).

In industry, independent reviews are essential. Competing entities are vying for finite market space, and so, “independent” entities are necessary to check the work of the other competing entities who are behaving for their own advantage. In community, all technical information is open source, and we recognize that we can behave in a way that is to everyone’s advantage.

At the systems level, at the level of the Community’s unified information model, we can all see and all check each others work. And, we work through our potential, purpose, and play. In industry, people work and compete for “income”. In industry, due to the socio-economic consequences associated with reviews and assessments, they are generally taken as judgments. In community, the evolution of a model is seen as a benefit to all.

1.8 Material-resource designation classifications

NOTE: *Issues with unavailable resources must be re-designed or they will have to wait until the resource becomes available.*

Material resources need to be accounted for through classification.

1.8.1 Allocation and availability designations

There exist six resource availability designations (or designated classifications):

1. Unallocated and available.
2. Allocated and available.
3. Allocated and unavailable.
4. Periodically available.
5. Unavailable - acquirable externally.
6. Unavailable - under discover & development.

Resource may be classified according to their availability level:

1. Level of Availability - High abundance.
2. Level of Availability - Low abundance.
3. Level of Availability - Depleted.

1.8.2 Energy analysis and designation

INSIGHT: *Energy sustainability isn’t only a behavioral issue, such as choosing to turn a light switch on/off or have a sensor turn it on and off; but enormous amounts of energy* *are predestined by the very design of the communities and cities themselves.*

Resources may be classified per a factor of their renewability quality:

1. Non-renewable resources (slow or no regeneration; external input into habitat service system).
2. Renewable resources (continuous or fast regeneration, external input into habitat service system).

Energy properties that distinguish one energy type from another include:

1. **Energy density** - how much energy (calculated) in a unit of volume.
2. **Power density** - how much energy (calculated) acquired from a unit of land or electrical generating machine.
3. **Spatial distribution** - refers to the geographical or spatial pattern of energy resources, generation, consumption, infrastructure, or availability across different regions or areas.
4. **Intermittence (intermittency)** - refers to the irregular or non-continuous nature of energy generation or supply. Alternating electric current is a highly controlled form of intermittence. Wind and solar are two examples of intermittent eletrical generation machines, wherein the intermittence is not-controlled by humans, but instead by solar system and climate.
5. **Energy return on energy investment (EROEI), energy return on investment (EROI), energy return on input (EROI)** - is a metric used to assess the efficiency and sustainability of energy production processes. It quantifies the ratio between the amount of usable energy acquired from a particular energy source and the energy expended or invested to obtain that energy. A high EROEI indicates that an energy source provides a significant surplus of usable energy compared to the energy needed to extract, refine, or produce it. Conversely, a low EROEI suggests that more energy is required to produce the energy source, potentially making it less economically or energetically viable.

   The formula for EROEI is:

   EROEI = Energy Invested / Usable Energy Obtained

   Annual return for renewables = EROEI / Operational Lifespan of Generator

   Note: Oil EROEI is returned over time from well to end use, renewables over lifetime.

Important energy usage related terms include, but may not be limited to:

1. **Energy return:** The total amount of usable energy obtained from a particular energy source, whether it be fossil fuels, renewable resources, or other sources.
2. **Energy investment:** The total amount of energy expended or invested in acquiring, extracting, refining, processing, and transporting an energy source. This includes the energy used in exploration, extraction, processing, transportation, and infrastructure development.
3. **EROEI threshold:** The minimum EROEI required for an energy source to be considered viable or sustainable. Different energy sources have varying thresholds; for example, conventional fossil fuels historically had high EROEI values, while some unconventional sources (e.g., tar sands, shale oil) have lower EROEI values.
4. **Net energy:** The surplus energy obtained from an energy source after subtracting the energy invested. It represents the energy available for societal use after accounting for the energy costs of obtaining that energy.
5. **EROI decline:** In some cases, the EROEI of certain energy sources might decrease over time due to factors like resource depletion, increased extraction costs, or technological complexities associated with extraction or production.
6. **Exergy analysis:** This concept evaluates the maximum useful work possible from energy systems, considering thermodynamics' second law and helping calculate the true 'value' of energy resources.
7. **Material flow statistical entropy analysis:** These calculations are used to assess the efficiency of recycling and the quality of recoveries from waste streams.
8. Thermodynamic accounting: Using formula and calculations that quantify the thermodynamic efficiency and sustainability of various processes.
9. **Potential energy** - is sitting energy in a barrel, reservoir, or ground.
10. **Kinetic energy** - is the objects in motion.

CLARIFICATION: *In common parlance the word "renewability" is applied to both resources and technologies; however, technologies are not renewable (a misnomer), they are re-buildable. Renewable energy using technologies (e.g., solar, wind, and water) have to be rebuilt every set number of years (because, they have a life-span and wear out).*

1.8.3 Substitutability

A.k.a., Alternatives, alternative resources.

The concept of substitutability, or the consideration of alternative resources, is crucial in the context of decisioning (Read: economics and resource allocation). Substitution analysis refers to an analytical evaluation of different possible uses for resources at any given time, focusing on the current moment rather than being hindered by past decisions. Once a decision has been made and executed—such as planting pear trees instead of apple trees—the options available for utilizing those resources are set along a certain path. In other words, to plant pear instead of apple trees—the pathways for using those resources become fixed to a certain extent (as in, occupying a fixed/continuous area on the landscape, and fixed, as in, used/past labor, tools, and energy). The trees that have been planted will produce specific fruits, and the resources (time, land, labor) devoted to them cannot be reallocated to produce something else in the short-term (i.e., 5-10 years, covering 2-3 master habitat planning cycles of 3-4 years).

The consideration of substitutability becomes most relevant when discussing the distribution of already produced goods, like the pears from the pear trees. At this point, the production costs and the decisions that led to the growing of pears instead of apples are fixed ("sunk") costs; they are in the past and cannot be recovered or altered. The trees need time, space, and resources to grow and produce useful products. These trees then become "fixed" (continuous) in the habitat as part of the cultivation system (for some genetically given lifespan, or until a priority demand arises that requires their removal). At this point, the initial decisions and the potentials they represented become historical facts; they are no longer variable.

There are various potential applications for the same set of resources at any given moment. Substitutability underlines the economic principle of potential ("opportunity cost"), which is the potential ("cost") of the next best alternative foregone. When deciding what resources to allocate or goods to produce, the potential benefits and negatives ("opportunity cost") of choosing one option over another is a crucial consideration. However, once the goods are produced, the potentials ("opportunity costs") associated with their production become irrelevant to their distribution. The decisioning process shifts from considering production alternatives to focusing on distribution alternatives.

To clarify, there are two decision dimensions in concern to substitutability (one on the production side, and one on the distribution/user side):

1. **Substitutability in production:** Substitutability of resources in an object assembly.
2. **Substitutability in distribution:** Substitutability of products in demand (e.g., apple versus pear).

In concern to production, the consideration of what to cultivate next (e.g., pears or apples) is guided by an adaptive, responsive approach to the local habitat residents' preferences and evolving conditions. Local habitats conduct cyclical master planning that involves a continuous re-assessment of the habitat's capacities, human demands, fixed/continuous ("sunk") resources, etc. In this framework, the decision to transition from growing pears to another fruit—or any other agricultural product—is not merely a reaction to immediate human demand/signals or past productions, but a strategic choice informed by a holistic view of long-term ecological balance, food security, and the well-being of the community.

In this context, substitutability is not just about replacing one type of fruit with another based on current demand, but about understanding and leveraging the dynamic interplay between various factors that affect the local habitat and the fulfillment of individuals therein. The planning process becomes a collaborative effort that engages local and regional residents, and InterSystem team decision working groups.

1.8.4 Scarcity analysis and designation

> **INSIGHT:** *In any general service, and in health in particular, if you don't meet or exceed critical [micro]nutrient sufficiency there will exist a lessening or worsening of function.*

'Resource scarcity' exists when a resource is simultaneously unavailable and part of the design specification of an unresolved issue. Some resource scarcity issues are of an urgent nature, such as life support incidents, and others are of a non-urgent nature.

Instances of resource scarcity may be resolved in the following ways:

1. The design changes to use less of a resource or not use the resource at all.
2. The resource becomes available.
3. A novel resource becomes available.
4. Another resource is substituted for the initially required resource. Here, substitutability refers to substituting one set of resources for another.
5. The design/service becomes unavailable due to an inability to acquire the resource or acquire a sufficient amount of the resource.

In community, if a particular resource is becoming scarce, then the system will alert the materials scientists (teams), and those in the larger community who have selected to receive said alerts, of the trending resource scarcity, and an alternative material solution will require development. If there isn't enough of a given resource; then there is an incentive (a motivation) to find an alternative so that the desired system can continue to do what we want it to do. Resource shortage (or scarcity) provides a motivating incentive to those to whom the resource scarcity imposes a possible artificial limit. In particular, resource scarcities to the 'continuous loop' services of the life and technology support system represents a threat to the survival of the community, and are a priority.

If resource scarcity exists then the technical process of 'resource development' exists. **Resource development** is the process of developing alternative resources through the interdisciplinary field of 'material sciences'. Resource development involves the development (or creative innovation) of novel resources to overcome resource scarcity issues. An emergency might require immediate development of a novel resource, and therein, the incident response operational process organizes an interdisciplinary team from the service systems to solve the problem.

Remember that the Decision System involves 'resource accounting' in the design of the habitat's service systems. By doing so, the generated (or engineered) state of resource scarcity is minimized or nullified. What remains is what is technically possible.

We know what resource inputs the service systems need to continue their operation [by degree] because we designed them.

Note that this economic model gives priority allocation to urgently needed resources: those resources that are needed for the sustained production of life support needs, and the stability and maintenance (i.e., inner loop), of the community's technological systems. This requirement for a sustained loop of resources to maintain the 'operational continuity' of notably prioritized systems is known as **inner loop prioritization**. Resources that are needed for the continuous functioning of an urgent system receive what is known as 'inner loop prioritization'. This prioritization is strategically designed for by the *Strategic Preservation Planning* operational process. And, the inner loop movement of resources is carried out by the *Maintenance and Operation* operational process. Inner loop prioritization simply means that a system requires the continuous allocation of a particular type, quantity and quality of resource to remain functionally stable. The inner loop is the known "operational cost" of the system and it involves strategic planning and resource budgeting. Essentially, the resources needed to maintain the operation of habitat systems, which have been designed, are known and are "budgeted for" so that knowable scarcities are avoided.

Most economic outputs are strategically planned and have an associated, and known, continuous 'operation and maintenance' resource cost, which are partially 'inner loop prioritized'.

A community desiring a higher potential state of existence might apply technological automation at the level of strategic design and preservation planning toward the overcoming of resource scarcity and the reduction or elimination of undesirable tasks by sentient beings.

"Anyone who believes in indefinite growth on a physically finite planet is either mad or an economist [for there are real resource limitations]."
- Kenneth E. Boulding & David Attenborough

1.9 System input-output tables and analytics

A.k.a., Resource planning, input-output literature, Input-output economic tables, input-output economic matrices, Scottish input-output table, Soviet input-output table, dynamic resource allocation problem, resource management, enterprise resource planning, logistics, economic planning mathematics, behavioral economics, economic mathematics

An input-output table is a matrix showing the input and/or output of information, energy, and/or material (or technology, etc.) between systems. The tables track and show sensible environmental elements that pass between systems. Input output tables are essential for decisioning where analytics will be run with the tables as an input, in order to sustain, and/or produce a better, outcome.

In the current, real world, there are limited resources that need to be assigned in real-time (i.e., finite resources that require allocation in real-time). In the market, these problems are concerned with, "giving humans what they want, when they want it".

All dynamic resource allocation situations deal with changing inputs and environments, some of which are (particularly, market-based scenarios) difficult to estimate and predict. In the market dynamic, resource allocation is difficult to predict because there is no unified, sufficiently integrated, working information systems model; thus, in the market, the future load on resources is not statistically dependent on the current load.

In a unified societal system, like community, one change triggers another change, and if the intention is to control the system with accurate decisions, then the decision system must consider the future status of the system.

Price adds abstraction to the calculation that dis-aligns the input-output table from optimal objective human fulfillment through the inclusion of abstraction (Read: money and authority) as reified (real) entities. Price confuses the table when the objective is mutual human fulfillment.

Fundamentally, dynamic environments (environments where change is continuous), require a dynamic control methodology -- require the selection of methods that can effectively compute real-time decisions about the allocation of resources and monitor execution.

STATEMENT: *It is important for us to develop the ability to remain accurately observant of our environment, and we can use technology* *to facilitate this by recording and tracking our observations over time and as a population.*

1.10 Resource types

A.k.a., Resource classes, resource categories, categories of resource, resource specifics, resource characteristics, resource descriptions.

Resources can be generally categorized into the following types:

1. **Resource classification based on renewability (stockability)** - the property of a resource to be replenished. This is a resource inquiry, a resource-side view of the system.
   A. **Renewable resources (replenishable)** - a resource that is replenishing itself at the rate it is used.
   B. **Non-renewable resource** - a resource that is not replenishing itself at the rate it is used. Natural resources that cannot be renewed are natural resources that have a very long regeneration time or cannot regenerate at all. Generally, non-renewable natural resources come from the mineral, metal and fossil fuel groups. Examples of non-renewable natural resources are hydrocarbons, metal, minerals, and certain types of aquifer water. Natural resources such as wood, animals, and fish can also be considered non-renewable natural resources when their use exceeds their regenerative capacity. The characteristics of the renewability of a natural resource include: (1) if used, the amount will decrease (unsustainable usage to production); and (2) cannot regenerate quickly in nature (too long a time; ecosystem decline).
      1. Minerals and metals:
         i. Minerals and metals are chemical materials that occur naturally in the planetary environment. Minerals and metals (inorganic chemicals) are considered non-renewable because when they are extracted, their quantity will decrease and will not increase in a short time.
2. **Resource classification based on criticality in a production [service and object deliverables]** - the necessity, which out which there is no alternative, to use this mineral or other resource. Note here that this is a production-deliverable side view. Some resources are critical to productions, and other resources are inter-changeable, with small quality differences (or not). Here, there are the categories of:
   A. **Substitutable resources**.
   B. **Critical non-substitutable resources** (minerals).
3. **Resources classification based on flow (availability)** - the property of a flow to be available.
   A. **Resource flow (dynamic resource, energy source)** - a flow of objects, a process occurring between objects, a 'dynamic concept'. This is a concept and not a storable resources. The harnessing of these flows is intermittent due to natural processes. The natural dynamics/flows are:
      1. Sunlight ('electromagnetic' pulsation movement). Note that sunlight on ground surfaces is considered highly intermittent.
      2. Gravity ('electromagnetic' atomic pull movement).
      3. Atmospheric ('wind' movement). Note that wind near ground surfaces is considered highly intermittent.
      4. Water ('current' movement) Note that some water currents are continuous, whereas others are intermittent.
4. **Resources based on chemical composition:**
   A. **Resource static (static resource)** - a single object in a single unmoving frame of a dynamic (moving) universe.
      1. **Resource stock** - snapshot of stock of resource at one time, where there are a stock of a resource (or, easy on-demand replacement of stock).
      2. **Dynamic stock resource flow transformer** - these are a unique resource stock; they are the machines that produce electricity that powers the habitats of all of society. These systems harvest flows of matter to ultimately, delver electricity to services for human user functions.
5. **Natural resources** - anything that is available naturally for collection on earth (or in space) is a natural resource.
   A. **Biotic resources (a.k.a., organic resources, bio-resources, biological resources, organic matter)** - living and deceased life forms. Life is a natural resources that is continuous and renewable. The processes for the collection biotic resources is harvesting/cultivating. Biotic resources contain carbon. Organic matter is a natural substance with distinctive chemical and physical properties, composition, and atomic structure.
   B. **Abiotic resources (a.k.a., mineral resources, mineralogical resources)** - never living; minerals (e.g., metals, rocks, stones). Minerals

are natural resources that are finite and non-renewable. There are only finite amounts of each mineral. Minerals are considered non-renewable because they take a very long time to form (millions of years). Minerals do not regrow and they are not replaced or renewed over any duration of time relevant to humanity. Minerals cannot be made by living organisms. Minerals occur through non-living physical processes. The processes for the collection mineral resources is mining. Mining mainly includes the exploration, production, and processing of metals and minerals located in the Earth's crust. A mineral is a natural substance with distinctive chemical and physical properties, composition, and atomic structure. The general list of metals and minerals is: base metals, precious metals, rare earths, non-metallic minerals, minerals, cement, diamonds, glass, stone.

1. **Metallic minerals (a.k.a., metal minerals, metals)** -
   i. **Base metals** - are found in abundance on the planet.
   ii. **Precious metals** - because they are not found in abundance on the planet like base metals are.
2. **Non-metallic minerals (a.k.a., non-metal minerals; non-metals)** - are a special group of chemical elements from which no new product can be generated if they are melted. Nonmetallic minerals are, for example, sand, gravel, limestone, clay, and marble. Such materials lack metallic characteristics like good electric and thermic conductivity, luster, rigor, and malleability. Nonmetallic minerals are used in the production of cement, ceramics, glass, lime products, etc. The transformation of nonmetallic minerals into these products is often an energy-intensive process, which can include several steps, such as heating, grinding, mixing, cutting, shaping and honing. The 'non-metallic mineral products' sector of the economy ("industry") was formerly known as the 'stone, clay, glass, and concrete products' industry. Under the North American Industry Classification System (NAICS), this subsector is separated into clay product and refractory, glass and glass products, cement and concrete products, lime and gypsum products, and other non-metallic mineral products.
3. **Hydrocarbons (a.k.a., energy minerals, chemical precursor minerals)** - these are fuel and chemical production resources. Energy minerals are used to produce electricity, fuel for transportation, heating for homes and offices and in the manufacture of plastics. Energy minerals include coal, oil, natural gas and uranium. Hydrocarbons may also be considered a biotic resource because it contains carbon).
   i. Hydrocarbons can be used for:
      1. Power production through combustion.
      2. Manufacturing through multiple chemical processes.
4. Minerals classified according to their usage:
   i. **Energy minerals** including coal, gas, etc., which are used to produce power.
   ii. **Construction minerals** including sand and gravel, brick clay and crushed rock aggregates used to manufacture concrete, bricks and pipes and in building houses and roads. These minerals produce architectural constructions.
   iii. **Metal minerals (metals)** - all minerals that are metals (a broad usage classifying category).
   iv. **Industrial minerals**, otherwise known as non–metallic minerals, used in a range of industrial applications including the manufacture of chemicals, glass, fertilisers and fillers in pharmaceuticals, plastics and paper. Industrial minerals include salt, clays, graphite, limestone, silica sand, phosphate rock, talc and mica. These minerals produce manufactured items.
   v. **Renewable (power production) technology minerals**, are primarily metallic mineral and include rare earth minerals.
   vi. **Agricultural minerals** for fertilization, including nitrogen, phosphorus, and potassium.

6. **Sources of resources** - the originating location.
   A. Minerals are sourced from mining operations.
   B. Biological are sourced from cultivation operations.
7. **Developed resources (a.k.a., human-made resources, synthetic resources, cybernated resources)** - are deliverables (products) that occur when humans use natural things to make something new that provides use [to human and ecological life]. For example, when productions use metals, wood, cement, sand, and electricity to make habitats, machinery, vehicles, bridges, roads, buildings, tools, toys, etc. they become man-made resources.
   A. **Hydrogen** - this is a fuel and chemical production resource. This is an energy carrier,

and must be human made. Hydrogen has to be made, either via gas or electrolysis.
   B. **Computation** - this is statistical machine intelligence.
8. **Habitat resources (societal-made resources)** - all human-made resources are dependent on the availability of contributed natural resources

1.11 Resource information unit accounting

A.k.a., Complete resource survey, resource survey analysis, total resource accounting.

Each resource unit has the following classes of associated data:

1. Class of resource.
2. Location.
3. Allocation.
4. Quality.
5. Purity (integration).
6. Statuses.

1.11.1 Economic resource accounting

Economic accounting requires the identification of resources as they pass through the different phases of materialization.

Resource flow tracing (resource tracking, resource following, resource) involves materials that move through different phases and acquire recursive IDs at each phase:

1. Chemicals are incorporated into materials, which are incorporated into technologies that produce habitat service systems and products (for usage/consumption) as the deliverable(s) for global human need fulfillment.
   A. Chemical ID *(raw)* > Material ID *(1st composition)* > Technology ID *(2nd composition)* > Deliverable ID *(3rd composition).*
      1. Chemical ID > Material ID > Technology ID > Deliverable ID.

The phases of materialization into which resources can be classified, composed, and identified/coded include:

1. **Identity** (ID; a.k.a., identifier, code, class code, etc.) - identifying an object (in the economy) as separate from some other object.
   A. This is a useful way of recognizing and differentiating.
2. **Element ID** (a.k.a., raw chemical element ID, chemical ID).
   A. Chemical element identifier/label.
   B. This a useful chemical unit ID.
3. **Material ID** (a.k.a., useful material ID, material code, resource ID, resource code)
   A. A material is that which is used in production (i.e., in a technical unit) or directly by a user.
4. **Technology ID** (a.k.a., technical unit ID, production unit ID, technical production unit code, service production unit ID, production service unit code).
   A. A technical unit produces something for either another technical unit or the end user.
   B. This is a useful technical unit ID.
5. **Service ID** (a.k.a., habitat service ID, service support ID, support service ID).
   A. Technical units are part of service systems and produce deliverables for those service systems. Those deliverables then enter into service for the user.
   B. This is a useful service unit ID.
6. **Deliverable ID** (a.k.a., good ID, product ID, model-serial-service ID unit code, habitat service object ID).
   A. A deliverable that is used by an end common and/or personal access user in the habitat, using one or more of the habitats services (objective-human use value).
   B. This is a useful product unit ID.

CLARIFICATION: *Resources in each phase are composed into a 'unit of account'. The identification start with resource units, then material units, then technology units, then deliverable units, some of which are final, and others intermediary.*

1.11.2 Resource application accounting

Resources occupy real-world spacial coordinates, volume at a location. It is important to identify what the resource is to be (or, being) used for:

1. What are the physical tasks done by using the resource?
2. What are the needed services done by integrating the resource?
3. Is the resource integrated into a technical [production] unit? Or, is the resource integrated into a user unit? For example, a tennis racket is a "user unit". The machine(s) that produces tennis rackets is a "technical unit".
4. Is the resource a source of power (energy, fuel, etc.) for a machine?

1.12 Capacities

A.k.a., Resource application capacities).

Capacity refers to the amount of some output (deliverable) produced given a set of inputs (resources). Biological and mechanical systems have capacities for operation. A sufficiency of the appropriate inputs will lead, in such a productive system, to a sufficiency of the appropriate outputs.

The notion of capacity encompasses the following two significant terms:

1. **Threshold** - how much of a resource is available to be used in a way that meets (community values and objectives) and does not exceed carrying capacities.
2. **Allocation** - a translation of thresholds into an organization access perspective. How mow much of what is available is available for personnal, common and team access.

Every economic system has capacities, thresholds, and the necessary allocation (of resources) to service continuation, based on resource inputs:

1. **Planetary capacities** - planetary ecosystem service capacities.
2. **Local ecosystem capacities** - capacities of local and regional ecosystems (to absorb waste and/or produce biotics).
3. **Global habitat network capacities** - global productive capacities.
4. **Local habitat network capacities** - regional productive capacities.
5. **The capacities of the local habitat** - productive capacities of a single habitat.
6. **Productive capacities** - what can be produced with what is.
7. **Reserve capacities** (a.k.a., reserve production capacity, inventory, reserve stock) - if new resource inputs stop, how much longer can production occur.

The two master resources have their own production capacities:

1. What mineral production capacity is required to meet the needs of the global population in the global habitat network, given mineral requirements for technical units.
2. What power production capacity is required to meet the needs of the global population in the global habitat network, given mineral requirements for technical units.
3. What manufacturing production capacity is required to meet the needs of the global population in the global habitat network, given mineral requirements for technical units.

1.12.1 All technologies have requirements for minerals

All technical units, as well as their productive outputs have requirements for minerals. The availability of minerals imposes a universal restriction on all outputs across technical units, significantly influencing their productivity. The constraints on minerals impact all outputs across technical units and their productivity. Some of these minerals are vital for construction and operation, being both irreplaceable and essential.

The fundamental constraints on minerals as resources in technical units and their deliverables are:

1. Is the mineral critical to construction and operation?
2. Is the mineral unique and has no replacements?

1.12.1.1 Critical mineral types for technical units in the power support service system

The critical technologies needed for hydrocarbon technologies are:

1. Furnace.
   A. Engine (with or without an electrical turbine).

The critical technologies needed for non-hydrocarbon ("clean/renewable") technologies are:

1. Solar Photovoltaics (PV).
2. Wind.
3. Hydro.
4. Concentrating Solar Power (CSP).
5. Bioenergy.
6. Geothermal.
7. Nuclear.
8. Electricity networks.
9. Electric vehicles (EVs) and battery storage.
10. Hydrogen.

> **CLARIFICATION:** *The relative importance of minerals for a particular clean energy technology may go from low (composition/integration in technology) to high (composition/integration in technology.*

The critical minerals needed for non-hydrocarbon ("clean/renewable") technologies are:

1. Copper.
2. Cobalt.
3. Nickel.
4. Lithium.
5. Rare Earth Elements (REEs).
6. Chromium.
7. Zinc.
8. Platinum Group Metals (PGMs).

9. Aluminum.

1.12.1.2 Metals needed for renewable power generation sources

The following are the common metals needed for each type of power production system (Micheax, 2021):

1. **Hydrocarbons:**
   - Copper
   - Nickel
   - Cobalt
   - Chromium
   - Manganese
2. **Li-ion batteries:**
   - Lithium
   - Nickel
   - Cobal
   - Graphite
   - Copper
   - Aluminum
   - Iron
   - Silver
3. **Wind turbines:**
   - Aluminum
   - Chromium
   - Copper
   - Iron
   - Lead
   - Mangnese
   - Molybdenum
   - Neodmium
   - Nickel
   - Silver
   - Zinc
4. **Solar PV panels:**
   - Silicon metal
   - Aluminum
   - Copper
   - Indium
   - Camium
   - Gallium
   - Germanium
   - Selenium
   - Tellurium
   - Lead
   - Molybdenum
   - Nickel
   - Silver
   - Zinc
5. **Nuclear fuel cycle:**
   - Uranium graphite (99.999% pure)
   - Aluminum
   - Chromium
   - Copper
   - Indium
   - Lead
   - Molybdenum
   - Nickel
   - Silver
   - Titanium
   - Vanadium
   - Zinc

2 Resource availability

The availability of resources must be understood and defined with the following identifiable data:

1. **Total global availability:** The (total) global, regional, and local *availability***.**
   A. Is the resource there (i.e., where is it present currently)?
2. **Total global accessibility:** The (total) global, regional, and local *accessibility*.
   A. If the resource is there, is it accessible, and how is it accessible?
   B. At what level of quality is the resource accessible?
3. **Total global production:** The (total) global, regional, and local production rate (*production*).
   A. What is the rate of production of the resource?
   B. What is the quality of the produced resource?
4. **Total global consumption:** The (total) global, regional, and local consumption/usage rate (*consumption/usage*).
   A. What is the rate of consumption/usage of the resource?
   B. What is the quality of the consumed resource?
5. **Total global planning:** The (total) global, regional, and local rate and quantity of planned/expected usage (*planning*).
   A. What is the expected future rate of usage of the resource, and for what duration of time is that rate stable/dynamic?
   B. What is the expected quantity of resource required?
6. **Total global recycling:** The (total) global, regional, and local fixed recyclable percentage (*recyclability*).
   A. What is the quantity and quality of the resource that is fixed and non-recyclable?
   B. What is the quantity and quality of the resource that is fixed and recyclable.
7. **Total global reserving:** The (total) global, regional, and local stock inventory and reserves (*reserving*).
   A. What is the quantity and quality of the resource in stock.
   B. What is the quantity and quality of the resource in reserves.

The purpose of a resource survey is to acquire sufficient information to plan for the requirements of oneself and of future generations:

1. Total global availability - is the resource there.
2. Total global accessibility - can the resource be acquired?
3. Total global production - can the resource be produced into some usable material?

4. Total global consumption - at what rate is it being consumed?
5. Total global production deficit - does the consumption of the resource exceed the production?
   A. If no, are they equal, or is there an increasing stock?
   B. If yes, how often does demand exceed supply?
6. Total global planning - will there be sufficient for the future of our generation and others?
   A. Total global economic design and re-cycling. Are the resources for material systems being accounted for at the global planning level?
   B. Total global reserve stocking. Are the resources being stocked at the global level where planned?

It is relevant to note here that there are three (or four) typical "view" levels for to resources:

1. The global *view* - what is happening, or could happen, globally.
   A. Identify all resources and potential resources in the global habitat network.
2. The regional-distance *view* - what is happening at a regional level, based on distance-transport-power parameters.
   A. Identify all resources and potential resources in the regional-distance habitat network.
3. The regional-States *view* - what is happening at a regional level based on the geographic positioning of State borders.
   A. Identify all resources and potential resources in the regional-State habitat network.
4. The local *view* - what is happening at the level of an individual habitat (in the global network of habitats).
   B. Identify all resources and potential resources in a local (single) habitat network.

There are several basic terms related to resources availability:

1. **Potential [resource]** - resources (and resource classes) that may be available in the future. This data is placed into a resource readiness level matrix.
2. **Alternative [resource]**- in reference to an alternative resource/material that provides the same or similar qualities as an originally used material.
3. **Developed [resource]** - these are resources (and resource classes) that are currently available for application.
4. **Stock [resource]** - these are physically stored, inventoried resources. For example, the amount of petrol in an engine's petrol tank. A stock is an amount of something that should be able to be easily accessed and used.
5. **Reserve [resource]** - often used interchangeably with stock, but may also be a separate category - an amount stored after [the amount stored in] 'stock' in case of intermittent 'stock' depletion. For example, the amount of petrol stored in a separate petrol tank on the vehicles exterior. Reserve is an amount that if depleted could mean a critical incident issue has emerged.
6. **Deposited [mineral resource]** - these are minerals deposited ("stored") within the crust of the earth.

Resources become available through:

1. **Discovery** - the work that goes into knowing of and locating a resource on the planet.
2. **Acquisition** - the work that goes into gaining access [touchable] to that resource.
3. **Collection** - the storage of a resource that has been acquired.
4. **Usage** - when a resource is integrated into a technological system or directly used by a user.
5. **Re-cycling** - when the resource is fully used, its materials are re-cycled (in relation to their entropy and the power available for re-cycling).
1. **Renewability** - the ability for the resource to be re-created through natural processes and a human time-frame.

2.1 Resource renewability and sustainability

A.k.a., Renewable material resources, sustainable material resources, sustainable mineral resources.

The sustainability of resources (materials) refers to several factors:

1. A sustainable material is a recycled or bio-sourced material that can be renewed over the lifetime of a human being.
2. The sustainability of a product is defined by more than just the materials that make it up. To reduce the environmental impact of a product, everything that goes into its creation must be analyzed [from cradle to grave].
3. Sustainable product accounting must include:
4. Sourcing of materials.
5. Transportation of materials
6. Production of the product.
7. Transportation and distribution of the product.
8. The performance of the product while in use.
9. End-of-life recycling

At what rate, under what conditions, and with what calculated results are resources types being used:

1. **Biotic resource sustainability** (biological regrowth, **RENEWABILITY**) - biotics are naturally occurring biological life-forms (species) that develop under species specific conditions. It is necessary to identify genetics and the environmental conditions under which those genetics are optimized and adapted. Biological resources, given appropriate genetics and conditions are a fully renewable resource. Biological [renewable] resources can be used at sustainable and unsustainable rates.
2. **Mineral resource sustainability** (**RECYCLEABILITY**) - Minerals are naturally occurring materials extracted from the geological crust of the Earth. Minerals are finite and non-renewing resources, except for hydrocarbon minerals, which take beyond human-relative time to regenerate. It is necessary to differentiate metallic minerals from non-metallic ones, because 'renewability' for operational purposes will be defined by the level of entropy (or disorder) that mineral use will generate. At the chemical level, the renewability of a chemical is simply one of expending enough energy to bring back the material from a higher level of entropy to allow for reuse or recycling. Energy output is required to reverse the entropy created by the mineral's use, which is the main metric to evaluate whether that material's use is sustainable or not. From an operational perspective, metallic minerals are used in lower levels of entropy. Hence, they are usually able to be recycled. Conversely, minerals like coal (or other hydrocarbons), the use of which converts the material to such a high level of entropy (dispersion in the form of carbon dioxide) that it is essentially non-renewable. Mineral usage may be considered sustainable when minerals can be retrieved after usage/service in usable form with relatively low energy expenditure and restorable environmental impact. Further, if conducted appropriately, the extraction process of a finite resource from the Earth's crust can be considered sustainable. In other words, it is extracted at a rate that actually meets requirements, and its extraction is not depleting available mineral deposits at a rate that would inhibit the human population of the future in having their requirements for minerals met.

A sustainable approach to mineral resource acquisition and production is one meets the human needs of the present without compromising the needs for the mineral requirements of future generations. Sustainable access of mineral resources seeks to attain a resource cycling plan between acquisition, stocking, usage, and de-/re-cycling.

Certainly, a sustainable mineral production accounts for the following mineral usage factors:

1. Minerals (resources in general) are used efficiently.
2. Minerals (resources in general) are re-cycled, where possible.
3. Minerals (resources in general) have alternatives in case of shortage.

In other words, a sustainable economic plan uses resources efficiently, recycles where energetically and technically feasible, and identifies alternatives in case of unforeseen availability issues.

The following is a simple data structure of sustainability associated concepts of resource access:

1. Sustainable minerals.
2. Sustainable chemicals.
3. Sustainable fuels.
4. Sustainable mineral fuels.
5. Sustainable power.
6. Sustainable mineral-integrated power technologies.
7. Sustainable habitats.
8. Sustainable mineral-integrated habitats services.
9. Sustainable society.
10. Sustainable societal access fulfillment.

2.1.1 Factors of material renewability

A.k.a., Renewable-type resources, material restorability factors, material sustainability factors.

More sustainable (restorative) materials are more likely to be from:

1. **Natural organic materials:** Use natural materials that are from renewable plant organisms (cellulose materials) as proximal to the site as possible (and that renew in a timely manner). For example,
    A. Wood - is a renewable resource that can be used for construction.
    B. Bamboo: is a rapidly renewable resources that can be grown and harvested quickly. It is also lightweight and durable with a high strength-to-weight ratio.
2. **Natural non-rare mineral materials:** Use natural non-rare deposits of clay and natural stone, from the site or elsewhere, proximal to the site or region. Clay can be turned into bricks and rammed into structures.
3. **Recycled materials:** Use materials that would

otherwise end up in the landfill, such as recycled plastics, paper, and textiles.
4. **Alternative plastics:** Several new types of plastics are made from renewable resources or are biodegradable, such as polylactic acid (PLA) and polyhydroxyalkanoates (PHAs).
5. **Electronic waste:** Disassemble as completely as possible all "electronic waste".

2.1.2 Resource recycling

Recycling is the collection and processing of unwanted materials into useful products.

The resource (Read: materials) recycling inquiry gathers the following data in order to determine recyclability:

1. Once the resource has been integrated into a system, in order to remove it and re-use it, what is required?
   A. As tools and other materials?
   B. As power?
   C. As ecological restoration?
2. What amount of the total material can be recovered?
   A. What is the quality of the material that is recovered?
3. What amount of the total material cannot be recovered?
   A. Where does the unrecoverable material go?
4. Identify: Is the product in which the resource is (is to be) integrated a single or multi-use product before going to recycling?
   A. Was the product in which the material is composed to be used just once and then wasted, or will it be used multiple times before its lifetime is complete?
5. Identify: Is it better to design a product that is less durable and more recyclable, or a system that is less recyclable, but more durable?

Mineral recycling specifics include:

1. Many minerals recycled after usage in industrial and manufacturing processes may only be reused as construction fill.
2. Glass may be recycled through melting or crushing. Crushed glass has many uses, including for use as a sand alternative and construction aggregate.
3. Metals are simple to recycle as they can be melted and used to make new products; although some metals may be used in such small amounts in some products that it would be very inefficient to recover them.

2.2 *Resource acquisition methods*

A.k.a., Processes for the collection of resources.

All physical resources are acquired and collected into a repository.

There are three methods for the acquisition of resources:

1. Extraction by mining minerals (elements/abiotics).
2. Cultivation by growing biotics (life/organisms).
3. Human-made with machines (a.k.a., developed resources; e.g., hydrogen from electrolysis process of material interactions). Here, there is synthetic chemistry and synthetic biology.

The typical processes involved in resource acquisition and raw processing from the earth's crust include:

1. Mining - physical extraction and collection.
2. Transporting - transport from the mine to a production (materialization) center.
3. Primary cutting - to cut the mineral to a desired next transport or next processing stage (may happen at the mine or at a production facility).
4. Primary crushing - to crush the mineral to a desired next transport or next processing stage (may happen at the mine or at a production facility).
5. Stockpiling - concentrating the mineral in a local area.
6. Eletcromagnetic processes:
   A. Microwave heating (pre-treatment) - microwave pre-treatment can facilitate the liberation of minerals from an ore.
7. Mechanical processes:
   A. Cutting, grinding, and milling (e.g., cutting stone for furniture or tiles).
   B. Floatation.
8. Chemical processes applied to the mineral:
   A. Hydrometallurgy:
      1. Leaching.
      2. Solvent extraction.
      3. Electrowinning.
   B. Pyrometallurgy:
      1. Froth floatation.
      2. Thickening.
      3. Steaming.
      4. Smelting.
      5. Electrolysis.

Note that the typical desired result of these processes is a pure element.

2.2.1 Mining

Only a minority of chemical elements, such as silver and gold, are found uncombined as relatively pure native element minerals. Nearly all other naturally occurring elements occur in the Earth as compounds or mixtures. Similarly, air is primarily a mixture of the elements nitrogen, oxygen, and argon, though it does contain compounds including carbon dioxide and water.

Mining element categories by degree of bulk availability:

1. All elements (all ores, including metals and non-metals).
   A. Industrial ores (industrial minerals and metals) - are found in hulk quantities on the earth).
      1. Technology and precious metals and ores - are not found in bulk quantities on the earth).
   B. Fuel mineral ores - are no longer found in bulk quantities.
   C. Chemical precursor synthetic-source mineral ores - are no longer found in large bulk quantities.

It is important to note that in general, the time taken to discover a mineral deposit to the construction of a functioning mine is between 15 to 20 years.

2.2.1.1 Resource convertibility

A.k.a., Resource conversion.

Resource convertibility refers to the ability to mine and produce a resource (i.e., mining resource and habitat mineral materialization is about resource convertibility).

The following need to be done to convert a raw resource into a finished production:

1. Converting targets to real-world mineral/resource discoveries.
2. Converting discoveries (geo-positions) to extracted and collected resources.
3. Converting resources to reserves (stocking).
4. Converting reserves to production (using).

Note: All steps are about sustaining the user demand for habitat services.

In concern to resource conversion, there are two common metrics. The first common metric focuses on the resources reserve base, because of the long times associated with building a resource base.

- Look at reserve base, identify the "cost" of acquiring (re- and/or pre-) the reserve base.

The formula for the industrial resource reserve base is:

- X = Industry reserves at year 2010 for a mineral.
- Y = Industry reserves at Year 2020 for the mineral .
- Z = Production of mineral from 2010 to 2022. All of production came out of the former reserve base.
- *Net additions to the mineral (eg., copper) reserves: Y - X + Z

**Net additions to mineral reserves shows some combination of exploration and raw processing success.*

The second common metric is the efficiency of exploration metric, where:

- Z = net reserve additions. Answer whether reserves have increased or decreased as measured in mass/weight/stock.
- A = cost (financial, trade, electricity, technical units) of making additions. Answer what has been spent over one year getting copper reserves in financial cost.
- A/Z cost per unit of adding reserves.

2.2.1.2 Mineral mining specifics

The following is a brief description of key factors associated with mining:

1. **Water:** Water is an important consideration in minerals planning as it often plays a key role in mineral extraction and processing. Unsafe mining practices may over-extract and pollute local water systems. Water drainage from mineral extraction must be monitored closely as dissolved or suspended minerals can damage fisheries and wildlife habitats. Mineral operations and tailings (finely ground waste) installations must be designed and monitored in order to avoid overflows which could result in contamination and flooding.
2. **Copper:** Copper occurs naturally in a pure state throughout the earth's crust; however, it is primarily mined from chalcopyrite, bornite, and malachite. Copper ore is extracted from the earth, then converted into copper concentrate, which is then roasted, smelted and converted into refined copper.

2.3 Resource readiness matrix

A.k.a., Resource readiness index, resource readiness level, resource development level, resource development index, resource dependency level, resource development phases, etc.

It is possible to develop new resources for new applications, and it is possible to develop alternative resources for existing applications. A resource development matrix depicts the position of new and alternative resources in relation to how complete and ready the resource is to integrated into a technology. Resource readiness levels (RRL) are a type of measurement system used to assess the maturity level of a particular resource. This matrix is similar to the technology readiness level index, but represents the readiness/development level of the resources that go in to various existing and new technologies.

3 Unified habitat heritage network planning of resources

A habitat is viewable as one large technical unit, within which multiple groupings of sub-habitat technical units exist. The habitat is the unit that produces material life, technology, and exploratory service fulfillment. The habitat is a productive service system for humanity; it is a habitat service system.

In the market-State, future projections of global habitation (demand) are usually developed on past behavior and belief without recognizing that community expresses an altogether different materially integrated service environment.

> **QUESTION:** *What quantity of resources (minerals and biotics) and what kind of resources will be needed to source the construction of, and to operate, community-type habitat service systems.*

3.1 The habitat technical unit resource inquiry

> **INSIGHT:** *All resources are valuable and we ought to get the most out of every resource. And, the economy should serve humanity and ecological service regeneration so that the earth supports a healthy human ecology.*

At the habitat level, it is possible to consider the habitat as a single technical production unit; wherein, the resource inquiry becomes:

1. What is the dependency on a given resource?
    A. How much of the total habitation system uses the resource?
    B. How much of the resource is used in critical infrastructure?
2. Identify the resource producing unit (a.k.a., production unit, technical unit, etc.).
    A. What, why, how much, over how much time?
    B. Estimate future production.
    C. Identify alternative production sources?
    D. What, why, how much, over how much time will it take fully develop the alternative resource production unit (e.g., steel production).
3. How much of each given resource is in each habitat unit?
    A. Estimate of mineral content for each habitat unit. How much mineral is in each habitat unit?
        1. Estimate of metal content for each habitat unit. How much metal is in each habitat unit?
    B. Estimate of how much biological materials (dead and/or living matter) there is for each habitat unit. How much biological material is in each habitat unit?

4. What is the turn-over rate on a given resource, and is it sustainable (is depletion occurring)?
5. Are there alternatives to the given resource?
6. What is the time required to develop, construct (and commission) the habitat unit?
7. What is the human work required to develop, construct (and commission) the habitat unit?
8. What is the human work required to continuously operate the habitat unit?
9. How much of each resource does the habitat unit use over the course of its life-span?
   A. How much fuel and/or flow is required for each habitat unit to operate.
10. How much can be recovered from the habitat unit after de-commissioning?

Unified planning (through integrated habitat master planning and statistical economic services) is the optimal way to efficiently allocate resources for globally optimized human need fulfillment. In order to optimize the acquisition and transformation of resources into needed goods and services, the following data must be identified/collected.

Any physical construction is composed of resources and processes. Useful processes done to resources are called tasks. A habitat is, in part, a composition of tasks. It is possible to identify, given transparency, [human need fulfillment] tasks and the resources required to complete/fulfill them:

1. What are the total tasks done and powered by fixing in minerals?
2. Flow in minerals to production systems that do tasks with power.
3. Flow in minerals to deliverable system that do tasks with power.
4. What are the total tasks done and powered by using minerals as fuel?

Determine true scope of useful work done (identify human needs and the scope of requirements for fulfillment):

1. Calculate the quantity and quality of minerals needed.
2. Calculate the quantity of fixable minerals needed.
3. Calculate the quantity of fixed minerals for production systems needed. Fixed in minerals to production systems.
4. Calculate the quantity of fixed minerals for user deliverables needed. Fixed in minerals to human-user object deliverables.
5. Calculate the quantity and quality of electrical power needed.
6. Calculate the quantity of mineral hydrogen (or other) resources needed as fuel.
7. Calculate the quantity and quality of mineral hydrocarbons needed as fuel and chemical precursor.
8. Calculate the composition maintenance resources needed.

The classes of habitat, for which there are some number of each:

1. Population number and architectural density.
2. Life phase (education & contribution, leisure).
3. Primary production type (cultivation, light, heavy, etc.).

Number of service-object (always, by class):

1. Architectural restoration - number of dwellings by class. Number and class of occupancy.
2. Architectural Production - number of InterSystem team buildings. Number and class of materialization technologies.
3. Architectural medicalization - number of medical team buildings. Number and class of all equipment.
4. Transportation - number of vehicles by class. Number and size of transportation paths.
5. Power - number of power stations by class. Number and size of batteries.
6. Water - number of water stations by class. Number and size of reservoirs.

Architecture support for shelter (for example):

1. An understanding of what and when to use architecture.
2. Medical support for rejuvenation:
   A. An understanding of what and when to use recuperation technologies.
3. Cultivation support for nutrition and biotic resources:
   A. An understanding of what and when to cultivate biological life.
4. Power support for technological motion:
   A. An understanding of what and when to use fossil fuel (hydrocarbons).
   B. An understanding of what and when to use nuclear fuel.
   C. An understanding of what and when to use gravity-solar motions (solar flows, water flows, etc.).
   D. An understanding of what and when to use an electric vehicle (EV).
   E. An understanding of what and when to use a hydrogen fuel cell (a.k.a. hydrogen power cell, H2-cell).
      1. Estimates of an electrical systems (EV) and hydrogen systems (H2-cell) to rail transport.

2. Estimates of an electrical systems (EV) and hydrogen systems (H2-cell) to maritime shipping fleet.

3.2 Resource life-cycle analysis visualization

A habitat master plan must visualize a full resource flow-chain cradle-to-grave, encompassing all resources from biotics, abiotics, and energy. It is further possible to map out all minerals going into all metals going into all service-products in the world (i.e., all minerals going into metals that go into products in habitat services systems). A mineral life-cycle analysis must be done on the construction materials used in the construction of the habitat.

Master plan visual resource accounting, simplified:

1. Identify the master plan of a habitat.
2. Within the habitat, design systems to last.
3. Identify the habitat objects and processes lists (note: processes occur to objects).
4. Identify the composition of all the objects over time/phase-of-life.
5. Create a life-cycle flow model as the objects (resources) move into, though, and out of the habitat as part of 'life', 'technology', and 'exploratory' need categories.
6. Identify current production of minerals (and other required materials).
7. Identify current sources of minerals (and other required materials).
8. Identify whether the current masterplan [for the habitat] is feasible given mineral availability.
9. Identify whether duplication of a constructed habitat is possible given mineral availability.

3.3 Resource-based economic calculation

Economic calculation is based on resource availability and [human] economic calculation. This calculation is done differently depending upon the specific societal system configuration:

1. A market configuration:
    A. Profit-over-others [from production].
    B. Owners [of production].
    C. Employees [of production].
    D. Consumers [of production].
2. A State configuration:
    A. Credit-tokens management.
        1. Money (circulation of credit-tokens).
        2. Sinngle use credit-tokens (no circulation).
    B. Work and operational regulation (including, working hours, zoning, competition & consumer protection laws, etc.).
    C. Police/military (regulation of work & population).
3. A community configuration:
    A. Human requirements.
        1. Needs from a societal system with a habitat service system.
    B. Resource requirements.
        1. Physical resources.
        2. Human labor.
    C. Resource availability.
        1. Physical resources.
        2. Human labor

NOTE: *The primary need-resource that all species manage (coordinate) is food. In other words, food is the basis of the economic system of all species.*

There are series principal questions that this calculation requires the integration of:

1. What are the **NEEDS**?
2. What are the **DELIVERABLE REQUIREMENTS**?
3. What are the **OPERATIONAL UNITS** that must be produced (i.e., of what socio-technical systems are the integrated habitat service systems composed)?
4. What are the technical **TOOL UNITS** that must be produced to produce the operational units?
5. What are the total **RESOURCES REQUIREMENTS** for the system?
    A. What are the resource requirements for the tool units?
    B. What are the labor (human work) requirements for the tools units?
    C. What are the resource requirements for the operational units?
    D. What are the labor (human work) requirements for the operational units?
6. What is the total **RESOURCES AVAILABILITY** for the system?

3.3.1 Economic calculation inquiry using technical units composed of resources and labor

The total integration of information for economic calculation includes technical units composed of resources and of labor. In order to calculate for human needs, technical unit service, resource availability requirements, and human work potential:

1. What class of technical unit?
    - E.g., Transportation technical units include trucks, commercial vans, passenger cars, etc.).
2. How far do they all go in one year?
    - E.g., What distance do they all travel in one year).
3. Qualification for comparative economic analysis/

calculation:

A. If everything was an electric vehicle and they did that amount of work (distance traveled in one year)?
   1. How much electrical power would they need to charge those batteries over that amount of time?
   2. How much extra electric power would have to be added to the existing power grid).

B. If everything was a hydrogen fuel cell and they did that amount of work (distance travelled in one year)?
   1. How much extra electric power would have to be added to the existing power grid).

C. If there was a mix between electric and hydrogen fuel cells?
   1. How much extra electric power would have to be added to the existing power grid).

4. What power generation must occur if gas and coal are phased out, and wind, solar, hydro, nuclear and geothermal are substituted?
   A. What is the preferred and predefined energy split between these substituted electrical power producers?
5. What is the mineral content by analysis of technical units?
   1. What is the mineral (particularly, metal) content per technical production and operation unit (IAEA data)?
   2. What is the mineral (particularly, metal) content in the average electric vehicle.
   3. What is the mineral (particularly, metal) content in different battery chemistries?
   4. What is the mineral (particularly, metal) content in the average power producing technical unit?
   5. Etc.
6. Project the results of the surveys onto the numbers needed to produce to requirements?
   1. Sum it all up and the result is a list of numbers by minerals (particularly, metals) of what is needed for EV's, their batteries, hydrogen fuel cells, and the electrical power producing systems, and stationary power storage.
7. When mineral mining is going well (at sufficient production), what is produced by mining?
   A. One generation of operational technical units last how long, before they are phased out and another unit set is required?
8. How many years of production is needed to hit the economically calculated target number of technical production units required for economic fulfillment operations?
   A. The target set is for one generation of technical [operational & production] units.
9. If x number technical units of a specific class are the target, then:
   A. Cars (transportation service technical units) last about 10 years (given 2023 production engineering). After 10 years, the cars are phased out and another unit set will need to be produced (again).
   B. Wind turbines (electricity production technical units) last about 20 years.
   C. Etc.
10. What are the current reserves of minerals (particularly, metals)?
11. What is the rate of depletion or acquisition of mineral reserves?
12. Where is mineral mining most efficient, and least environmentally degrading?

4 Resource accounting for societal re-configuration

A.k.a., Societal system transition resource accounting.

It is possible to assemble a habitat network (non-market, non-State, significantly non-hydrocarbon) systems that could do the same useful work [as that being done in the market-State in the early 21st century] primarily through trade, wages, coercion, and hydrocarbons. In part, the goal of this project is to replace the market-State type societal system with one that represents community (in the form of humane and ecological production). Community habitats are not focused on trade of property, but on human need fulfillment.

With sufficient access to data, it is possible to determine what configuration of energy and mineral mix could produce a community-type habitat network.

Using the same energy and integrated mineral mix as the early 21st century, determine:

1. How many community master planned habitats would fit that same volume.
2. How many current market-State urban, sub-urban, and rural municipalities can be transformed into community-type habitat environments?
3. How many new habitats are needed?
4. What can be recovered from the old environments?
5. What power must be produced?
6. What mineral quantity, type, and quality must be produced?

The three basic concepts this replacement entails are:

1. How dependent on trade is the information and habitat production systems.
2. How is coercion used and in what applications?
3. By what method and social orientation have been and are resources being integrated as fixed construction and used as fuels?
4. If the market-State were to be phased out immediately, what would be required from:
   A. People?
   B. Materials?
   C. Energy/power generation systems?

Necessary data for determining the replacement of the system includes, but may not be limited to:

1. How much of each of the classes of minerals is consumed at a global scale, and State regional scale?
   A. How is the existing market-State configuration dependent on them?
   B. What applications (services) are the hydrocarbons used for?
   C. Quantify each application in context of its replacement.
2. How much of each of the classes of hydrocarbons is consumed at a global scale, and State regional scale?
   A. How is the existing market-State configuration dependent on them?
   B. What applications (services) are the hydrocarbons used for?
   C. Quantify each application in context of its replacement.
3. How much of each of the classes of technical production unit are consumed at a global scale, and State regional scale?
   A. How is the existing market-State configuration dependent on them?
   B. What production systems are there and what are they used for?
4. How much of each of the classes of service unit are consumed at a global scale, and State regional scale?
   A. How is the existing market-State configuration dependent on them?
   B. What service systems are there and what are they used for?

4.1 Resource transition planning

Unified resource planning involves an identification of what is, what is being moved to, and what is needed for transition:

1. How much extra capacity is required to phase out non-humane habitations and start operating integrate restorative habitat productions.
2. How many new habitats will need to be created?
3. What transformations will need to occur to present urban, rural, and suburban zones?
4. Required power grid expansion to charge the needed batteries and make hydrogen.
5. Number of new power stations.

Estimates of phasing out urban, sub-urban, and rural neighbourhoods for a network of community habitats include, but are not limited to:

1. Phase out (reduce) bad architecture, bad aesthetics, bad infrastructural integration, bad life-radius zones, bad pollution zones, bad master planning as that without integrated infrastructural habitation service zones.
2. What would it take to replace the existing political economic system with a community-type one?
3. Phase out (reduce) economic secrecy and political

competition (corruption) for working groups, habitat master plans, and habitat teams.
4. What would it take to replace property with personal access, trade with common access, and coercion with humane behaviors?
5. Phase out (reduce) the perception that good access requires private ownership for common heritage production optimization.
6. What would it take to replace the existing market-State productions with information working groups, habitat teams, and educated users?
7. What would it take to replace competition over scarce resources with optimization of resource configurations for human fulfillment, given what is known and available.

Material requirements to produce a new generation of technical production units:

1. Estimates of total material by class (e.g., element ID, metal) required to produce one generation of technical production units (a.k.a., technology units; e.g., wind turbines)...to phase out fossil hydrocarbon fuels. Total of each element ID in, tonnes.
2. Reported global reserves in tonnes of each material at a set date (e.g., 2019).
3. Number of generations of technology units that can be produced from global reserves of each material. In, number of generations.
4. Global reserves as a proportion of materials required to...phase out fossil hydrocarbon fuels. In percentage of whole proportion (%). Current global reserves for a give material resource will achieve what percent of 100% full generation of the productive technology unit. 100% means enough of the material for one generation.
5. Global material mining and raw materials processing (e.g., metallurgy) production by class (e.g., element ID, metal) and rate (of production) at a set date (2019). In, tonnes of each element ID, per year.
6. How many years of production are required at the rate produced at the set date (e.g., 2019) to meet the material requirements to produce one generation [of the actual volumes needed of the] new technical production units. In, years.

4.1.1 Power production transitioning

The goal is an integrated network of habitat services. Possibly, this transition necessitates a transition from hydrocarbons as fuel producing power sources to direct electricity power production. However, in the early 21st century there is a financial-industrial system of significant abstraction and physical complexity that took more than a century to construct with the use of the highest calorific dense source of energy on the planet (i.e., natural ore hydrocarbons) in abundant quantities. Hence, if the transition is also one of the replacement of hydrocarbons with technical electricity production units, then how is this to occur, given what is current and what is possible in the near future.

4.1.2 Resource calculation and technical production unit calculation arc

The resource and technical production calculation arc involves the following inquiries:

1. What is the true scope in type, composition, number, and size of technical unit required) to fully phase out?
2. What is the optimal proportional mix (of technical unit classes) to phase out and then to operate the new habitat production system?

Electrical power technical units include batteries, hydrogen cells, solar panels, wind turbines, internal combustion engines, etc.

4.1.3 In the early 21st century

Some data about the early 21st century:

1. In 2018, 85.5 of global primary energy consumption was fossil fuel based. And, less than 1%of the vehicle fleet is electric.
2. The gas industry is the buffer between the require power and what power is produced by solar and wind.
3. In 2018 there are an estimated 1.416 billion vehicles that have travelled an estimated 15.87 trillion kilometers. (with approximately 1.5 billion as of 2022).

4.2 Resource efficiency analysis

A.k.a., Resource optimization inquiry.

Efficiencies can be compared between the types of power systems, for example, if an electric powered transportation system is the objective, then:

1. Hydrogen fuel cells have an energy to weight ratio ten times greater than lithium-ion batteries.
2. An electric vehicle system requires battery storage 3.2 times the mass as the equivalent fuel tank (@700bar) mass of a H-cell system. For the same energy storage mass, the hydrogen fuel cell can go 3.2 times as far or will last 3.2 times as long. But, hydrogen is not an energy source; it is an energy carrier (in the sense that the hydrogen must be human made). It is either made with gas or

electrolysis. To make the hydrogen using electricity, a hydrogen H-cell system will require 2.5 times more electricity compared to make the hydrogen compared to charging an electric vehicle battery system.

From this, the analyses result is that:

1. All short-range transport should be electric vehicle systems. All vehicles that stay in a city ~100km. All passenger cars, vans, trucks and buses (1.39 billion vehicles) would travel 14.25km in 365 days. This would require 65.19 TWh of batteries (282.6 million tones of lithium-ion batteries).
2. All long range vehicles should be powered by hydrogen fuel cells. All class 8 HCV trucks, the rail transport network (including freight), and the maritime shipping fleet.
3. In total, 200.1 million tonnes of hydrogen would be needed annually.
   A. 695.2million passenger cars at 5.4 million km.

4.3 *Risks to transitioning using resources*

Risks to the transition of society from a market-State configuration to a community configuration using resources, include but are not limited to:

1. Ecological service tipping point - the harm the market-State has caused is so significant that ecological services collapse and provide no habitat for humans (this is a highly unlikely scenario).
2. Cannot provide enough mineral materials.
3. Cannot provide enough biological materials.
4. Cannot provide enough labor.
5. Cannot provide enough power.

5 Acquisition of resources

There are three primary ways of acquiring more resources:

1. Extraction (minerals).
   A. Mining - is the extraction of minerals (elements) from the earth's landscapes and oceans.
      1. Solids.
      2. Liquids and gases.
2. Cultivation (biologics).
   A. Holistic restorative cultivation - is the cultivation of a diversity of flourishing life over the landscape of the earth and water for food, fuel, and fiber, and bio-diversity and eco-system services.
      1. Food.
      2. Fuel.
      3. Fiber.
3. Motivation (humans).
   A. Fulfillment and well-being - humans see the relevance and have the self-ability and availability.
      1. Social support.
      2. Residency.
      3. Contribution
4. Creation (computers).
   A. Simulation and collaboration - computation reveals the feasibility and predictability of the current configuration of the specification.
      1. Virtual reality experiences.
      2. Artificial intelligence.

5.1 *Mining for minerals*

There are three types of minerals to be mined, based on the three phases of matter (liquids and gases are grouped, because they both are flows, which require conduited hook-ups, versus cutting of solids):

1. **Solid mineral mining (cutting):** This represents the conventional form of mining where solid minerals or ores are extracted from the ground via cutting and pulling out material. It includes a wide array of resources such as metals (gold, silver, copper), minerals (coal, salt, gypsum), precious stones (diamonds, rubies), and industrial materials (limestone, granite). Solid mineral mining involves various methods like surface mining, underground mining, and open-pit mining, depending on the type and location of the mineral deposit. These are produced in cut "grain" units.
2. **Liquid and gaseous minerals (conduited hookup):** minerals in liquid or gaseous states are typically not extracted through cut-mining

methods. Instead, they are often obtained through specialized extraction techniques or drilling processes in the case of oil and gas. Hydrocarbon chains are the most sought after liquid and gas minerals, as are elemental gases.

A. **Liquid minerals:** these might refer to liquid hydrocarbons like crude oil, which are extracted through drilling operations in oil fields. It involves drilling wells and using specialized equipment to bring the liquid hydrocarbons to the surface.
B. **Gaseous minerals:** gaseous minerals commonly refer to natural gases such as methane, propane, and butane found in underground reservoirs. Extraction involves drilling and utilizing techniques like hydraulic fracturing (fracking) or gas well drilling to access and collect these gases.

5.1.1 Solid mineral resources

Solid mineral resources are typically cut further and/or reduced in their cut "grain" size to smaller and smaller areas and then particle size. Here, There's an implied correlation between decreasing mineral grain size and the energy required for grinding. The relationship suggests that as the mineral grains become smaller and require finer grinding, the amount of energy needed to achieve this reduction increases, possibly in an exponential manner. The exponential relationship implies that as the mineral grains reach smaller sizes, the energy consumption for further reduction increases significantly. This may be due to the increased effort required to break down the mineral grains into finer particles as they approach a certain size threshold. Consequently, finer grinding to reduce mineral grains to smaller sizes may demand a disproportionately higher amount of energy. Solid materials also use more energy to transport, because they weigh more.

This relationship is critical in mineral processing and mining operations as it influences the efficiency and location (and quality) of mineral product. Understanding the energy-size relationship helps optimize grinding procedures to achieve the desired particle sizes while considering the energy consumption involved in the process.

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TABLES

Table 16. Decision System > Inquiry > Resources*: Renewable classification.*

Resource Classification Table		
Non-Renewable	**Renewable**	**Resource Transformation**
Oil and Gas; Coal; Metals & Mining; Industrial Agriculture	Biofuels (hemp fuel); Solar Energy; Wind Energy; Hydro-Current & Tidal Energy; Fission/Fusion Energy (inherently dangerous); Permacultural Agriculture; Geothermal* Energy (*geothermal may not, in fact, be a renewable energy, at least not on massive scale; we need more research)	Chemicals; Organic Decomposers (Fungi & Bacteria); Electromagnetic Radiation; Quantum Information
Non-Replenishable; Possible Resource Substitution Necessary	Periodically and Cyclically Replenishable	Knowledgeably Replenishable (i.e., necessitates knowledge acquisition and communication)

Economic Calculation Inquiry Accounting

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Abstract

This decision system contains an economic resource resolution matrix calculation service with a set formula that solve for the optimally planned configuration of those resources, given a set of categorical human needs and common heritage resources. A society may produce economic planned allocations of resources in order to optimally meet human needs and preferences, socio-technical master plans are resolved and decidedly selected. It is possible to use statistical calculation to compute significant and certain master plans for the optimization of human need by means of common heritage resource configurations. Economic resource-service plans, composed into tables, identify and calculate the inputs and outputs of habitat services. This inquiry uses both linear algebraic graph-matrix calculations (in order to have tables of "matrix products" that can be compared) with statistical services (including sample collection and analysis) of the demand, through to solution development and selection, and thereafter analytics on operations.

Graphical Abstract

Image Not Yet Associated

1 Calculation accounting and inquiry

Calculation for habitat configurations is about meticulous planning and resource allocation. It is a systematic approach that utilizes calculated insights to take informed decisions, ensuring that the diverse spectrum of human needs is met in the most efficient and sustainable manner possible. This planning process is a critical component of decisioning, guiding the strategic direction of societal development and resource coordination. Economic calculation in the context of the decision system pertains to the process and methodology for planning and allocating resources within a society, distinct from traditional market-based or capitalist systems. It explains the "economic calculation problem," which traditionally argues that without price signals (provided by a market of supply-demand), rational allocation of resources is impossible. This problem posits that in the absence of market mechanisms, centrally planned economies cannot effectively calculate the needs for production and distribution of goods and services.

However, decisioning in community involves an alternative framework for economic calculation that does not rely on price mechanisms or private ownership to dictate the optimal allocation of resources. It can and may, however, use price during transition to facilitate the transition of people, information, and objects into a community configuration, and for leisure items therem (during transition to a vision of society without price or trade). Community is a model based on direct, participatory planning and contributed decisioning processes. This model aims to achieve an equitable distribution of resources, sustainable development, and the fulfillment of all individuals' needs through a cooperative approach (a service-to-other, and thus to self; v.s., service-to-self[-over others]. In community, the emphasis is on leveraging technology, comprehensive data collection, intelligence, education, residency and community input to take informed decisions about resource allocation, production, and distribution.

A societal decision framework involves economic activities driven by the collective global organization and its optimization of human persons and material resources. It suggests that through systematic planning and the integration of advanced decision support systems, a society can efficiently manage its resources in a way that prioritizes human well-being, environmental sustainability, and technological advancement. Community standards and intelligent master-planning decisions can easily overcome the challenges that market competition and profit motives are the only, or best, means to manage economic activities and resource allocation. In community, economic calculation within this framework is envisioned as a collaborative and dynamic information working group process (consisting of global standards decision working groups and local resident master-plan decision working groups; each of which is rooted in the principles of shared access, transparency, and sustainability.

In planning there is a mathematical (number count) and variable (concept/parameter) control space for calculation. The control "space" is defined as the "space" in which the controllable inputs are considered, processed together, and permitted as appropriate, through time. It is important to explicitly consider this "space" and understand how action in control "space" at time t_i impact the state space in t_i + 1,..,i + *n*. The envisioning of a control space makes it possible to encode the future structure of the production flows and interactions of an economy, and once encoded in a knowledge base, production plans can be computed.

Here, the community population desires to know how greatly its so-called “economy” actually economizes humanity's life-grounded resources by calculating their most efficient and productive [toward global human need fulfillment] usage, in the form of plans. Here, there are objects that have, at least:

1. type,
2. version (sub-type),
3. quantity (count),
4. geo-spatial location,
5. material characteristics,
6. functional characteristics,
7. priority.

Object master-plan assemblies (e.g., the habitat, a dwelling) are categorized as resource compositions, and two types of calculations may be performed on their master-plan solutions:

1. **A calculation that plans optimal allocation of resources of objects (create optimal allocation plans)** to services at specific locations given local and global demands. Mathematical optimization techniques such as linear programming, integer programming, and network optimization are used to solve problems related to allocation of resources, vehicle routing, inventory management, and supply chain optimization. This involves concepts from linear algebra (e.g., matrix operations for system analysis) and calculus (e.g., rates of change in production).
   A. Service resource allocation calculation [protocol, algorithm].
2. **An statistical intelligence analysis service for the socio-technical fulfillment of users (understand needs, preferences, and actualities completely)** through protocols that conform production to stated [societal] objectives. Statistics involves collecting, analyzing, interpreting, and presenting data to make informed decisions or draw conclusions about populations or

phenomena. Probability models and statistical analysis are used in forecasting demand, estimating delivery times, predicting inventory levels, and assessing risks associated with logistics operations.

A. Object[ive] production calculation [protocol, algorithm].

Economic calculation is a process that simulates out economic master-plan resource arrangements, identifies the current design specification's "economic" feasibility via a calculated threshold, and identifies optimal resource configurations. The main goal of the master-plan is to determine the best possible solution (habitat socio-technical configuration) in terms of function and form, based on resources and contribution, and create a plan (blueprint) that can be operationalized and function as a whole system [for global human fulfillment].

Economic calculation relies on user, production, and ecological surveys, and mathematical and economic resource models, which involve both linear algebra matrix calculations (for objects) and statistical calculations (for concepts):

1. **Linear-algebra matrix math calculations:** In [socialist] resource-service matrix economic planning, linear algebra is used to represent economic relationships, using input-output models or models of production and resource allocation, and using matrices/tables of data. Linear algebra can describe the flow of resources, goods, and services within an economy and analyze the impact of different production and allocation strategies, configurations, and service solutions sets. Here, resource configurations composed into socio-technical habitat services can be calculated and compared against one another using matrix math. From the matrix calculations come optimal resource-planned solution configurations. Here, it is possible to calculate the total cost of an issues resolution as its total measurable effect in reducing resource access for other needs (and service-objects) due to the new allocation of resources and human effort. What is the resource cost intra- and inter-solution? What are the resource costs between different solutions to the same issue (i.e., "intra-solution")? And, what are the resource costs between solutions to different issues (i.e., "inter-solution").
   A. What must be known is a precise habitat resource specification plan for the solution to calculate, using matrix mathematics (linear algebra) solutions with known and optimized resource allocations. Here, computers run many parallel processes to return/matrix calculated products of optimal technical production unit plans per resource, inclusive of thresholds and planned as specified socio-technical resource, labor, and knowledge configurations. Here, the quantities of what is produced (per the solution) are mathematically calculated for an effective-efficient economic system.
2. **Statistical-sample analytic math calculations:** Statistical methods may be used to analyze historical data, estimate parameters, and make

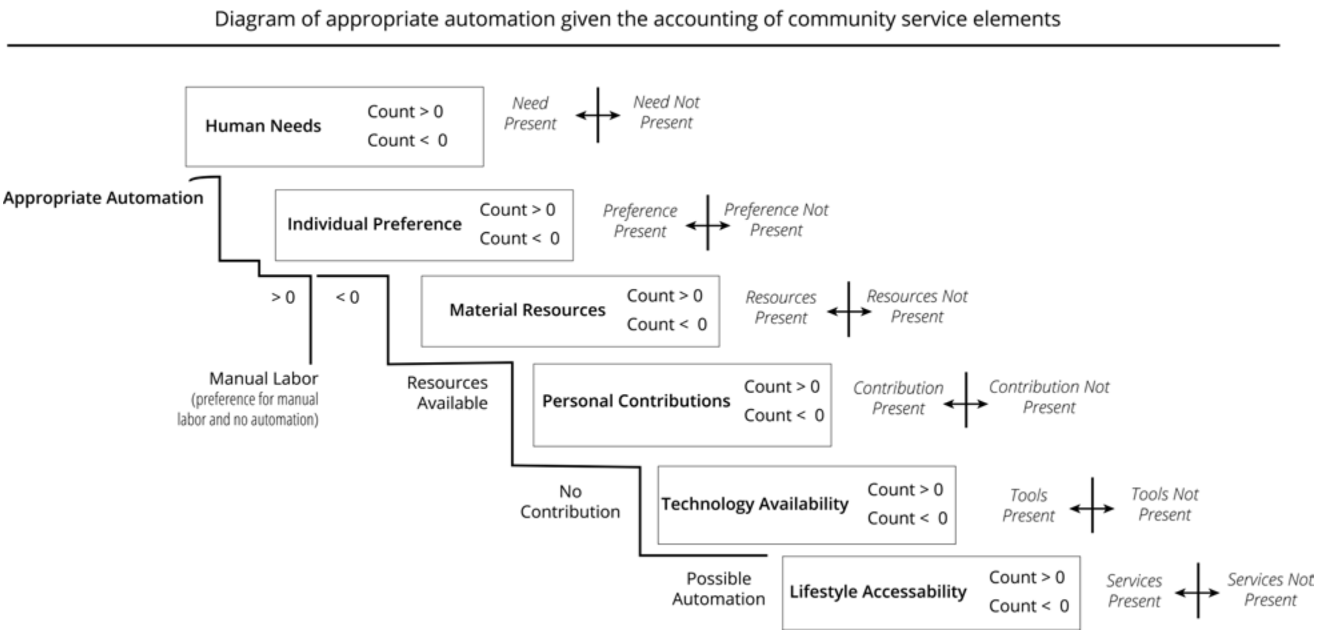

Figure 34. *Accountable habitat service elements for calculation of resource allocation and automation. Diagram shows appropriate automation given an accounting of community services.*

predictions about outcomes in the context of economic planning. For example, time series analysis, regression analysis, and statistical inference can be applied to assess past economic performance and forecast future trends. Significance, certainty, and deviation can be calculated as "statistics". Among other useful statistics gained. From statistical sampling and analysis comes the visualization of practical solution thresholds and parameters.
B. What must be known are data from environmental surveys, and the methods of statistical analysis.

The specific techniques and methods employed in socialist economic calculation can vary depending on the goals of the economic plan, the complexity of the economy, and the available data. Economic calculation inquiry planners may use a combination of mathematical models, linear algebra, statistical analysis, and computation to visualize and take decisions regarding resource allocation, production, and distribution (i.e., decisions about an economy).

An economic computational unit must:

1. Calculate the number needed to fulfill (as a demand survey threshold for final units), before resources are to be dedicated to its solution and productive execution.

Statistical analysis samples socio-technical fulfillment safety and quality/effectiveness. For any issue that requires societal coordination and contribution, the team population is sampled for purpose and objectives, and the user population is sampled for the presence and quality of need/issue, whereupon, statistics is a set of methods:

1. Search functions to sample data.
2. Conceptual data analysis (statistical criteria) on sampled data (e.g., mean, median, standard deviation, etc.).
3. Confidence/certainty analysis to be certain of statements about the data (e.g., p-value).
4. Power calculations to be certain of hierarchy.
5. Preference surveys to account for user data (e.g., user value).

In statistical system, the types and qualities of what is produced are mathematically calculated as a statistical service for the economic decision system.

For both mathematical systems (algebra and statical ones, there is the necessity for data search, data collection, data analysis, and decision threshold stopping rules.

Object linear variable measured description math (a.k.a., algebra) sub-inquiry and it's calculated resolution; and

Concept multi-variable measure description math (a.k.a., statistic) sub-inquiry and it's calculated resolution.

In order to calculate a plan for an economy, it is of significant importance to identify:

1. What a unit of production is (objectively):
   A. Objects.
   B. Processes.
   C. Complex of objects and processes.
2. What a cycle of production of that unit is:
   A. One cycle (e.g., on-demand, one actual production cycle).
   B. Multiple cycles (e.g., assembly-line production re-configurations over time).
   C. Flexible cycles (e.g., current production is customizable to continued adjustments of preference during production cycle).
3. What is the axiomatic unit [representational of the platform] for human-need fulfillment:
   A. A whole habitat (i.e., a complex of objects and processes).
   B. A usable service sector/area in a habitat (Read: habitat services can be sectorized within the perimeter of a local habitat; zoning).
   C. A usable object/good in a habitat (Read: people actually interact with objects that produce for end-users or are used by end-users; access designating to team, personal, or common).

A fundamental understanding of economic calculation requires, at least, an understanding of:

1. Understand systems thinking and methods.
2. Understand the basic elements and structure of input-output tables (IO tables).
3. Understand matrices (a.k.a., tables, spreadsheets, arrays), which are a presentation and calculation tool. A table (or, matrix) consists of the figures in a spreadsheet, arranged in a specified order, and from which charts (or, tables) undergo mathematical operations. Spreadsheets can show the relationships in an economy visually, interactively, and they can have the calculations done upon them.
4. Understand key aspects of linear algebra. Understand the use of linear algebra to create a system of linear equations from the IO table. Linear algebra codifies properties of matrices in the notion of linear maps. Matrix computation is the fundamental operation of economic calculation.
5. Understand how to setup a product system as a

set of linear equations, and express these as linear algebra.
6. Understand balances in IO tables.
7. Understand how to calculate a coefficient matrix (a.k.a., Leontief inverse, technology matrix, resource flow matrix, energy matrix).
8. Understand how to conduct a variable analysis.
9. Understand how to conduct statistical analyses.

Within a community-type societal system, the above "economic" information is calculated in the context of a larger decision systems that resolves complex state solutions to re-configurations of the natural, real-world.

1.1 Production calculation inquiry

A.k.a., Calculated production planning inquiry, central planning, central production planning, centralized economic planning, mathematical planning, etc.

The following taxonomy identifies the interconnectedness of mathematical modeling, simulation, and optimization within the context of production planning, emphasizing how they collectively contribute to informed decisioning and efficient production:

CLARIFICATION: *The choice of math depends on the specific problem or question being addressed and the available data.*

A simplified overview of the calculation planning system:

CLARIFICATION: *Each service below operates within the broader framework of the economic calculation service system, providing specialized expertise and methodologies to address specific aspects of economic decision planning. By integrating the outputs and insights from these services, the decision can formulate comprehensive plans that are informed by optimization models, complexity analyses, statistical forecasts, and simulated scenarios. This integrated approach ensures that the economic decision system is robust, adaptable, and capable of supporting a sustainable network of human habitats, with a focus on optimizing life, technology, and exploratory services to meet the needs of residents.*

1. **Linear optimization planning (e.g., kantorovich):**
   A. **Objective:** To optimize resource allocation and production processes using linear programming and other optimization techniques.
   B. **Functions:** Develop linear optimization models to maximize efficiency and productivity; solve resource allocation problems; optimize supply chain and logistics.
   C. **Applications:** Sustainable resource distribution, infrastructure development planning, and efficiency optimization in service delivery.
2. **Assembly complexity analysis:**
   A. **Objective:** To manage and reduce the assembly complexity of physical infrastructure and service systems.
   B. **Functions:** Quantify assembly complexity using specific metrics; implement modular integration strategies; conduct efficiency analysis to minimize complexity impacts.
   C. **Applications:** Design and reconfiguration of habitat infrastructure; integration of new technology into existing systems; scalability and adaptability of service delivery models.
3. **Statistical services:**
   A. **Objective:** To provide probabilistic analysis and risk assessment capabilities, supporting decision-making under uncertainty.
   B. **Functions:** Forecast demand and supply trends; analyze risk factors and their potential impacts; perform statistical quality control.
   C. **Applications:** Risk management and uncertainty analysis in resource provisioning; demand forecasting for life, technology, and exploration services; statistical analysis for policy development.
4. **Simulation services:**
   A. **Objective:** To simulate various operational scenarios and their outcomes, aiding in strategic planning and decision-making.
   B. **Functions**: Develop and run simulations to test the impacts of different decisions and external factors; use scenario analysis to explore future possibilities.
   C. **Applications:** Strategic planning for service evolution; operational resilience testing; exploration of new technological or service opportunities.

A complete overview of the calculation planning system:

1. **Mathematical modeling and optimization:** Utilizes linear algebra and statistical methods for solving optimization problems to make better decisions in production planning. Here, mathematical formula are used to represent [economic] production systems, facilitating the analysis and optimization of resource allocation and production processes for efficiency and effectiveness. Here, math is used to plan and optimize the design and construction of habitat service-object delivery systems.
   A. **Linear algebra mathematics (determinitive; deterministic planning services -- linear math):** Essential for modeling the structural relationships within the production process,

solving resource distribution of equations in production, and optimizing resource allocation. Required for expressing and solving optimization problems. Used for structural optimization in production. Used for modeling and analyzing the habitat service production system's structure and behavior under uncertainty.

1. Linear formulas express a deterministic relationship between two or more variables. Linear formulas represent exact relationships, assuming no other factors influence the variables. Linear formula describe deterministic relationships.
   i. Linear formula form: are expressed as equations involving linear algebra, inclusive of variables, constants, and arithmetic operations like addition, subtraction, multiplication, division, and matrix equations.
      1. Variables and coefficients can be represented by matrices, leading to matrix equations. Matrix multiplication is then used to resolve complex linear relationships involving multiple variables simultaneously. Matrix equations are still deterministic, just like traditional linear formulas.
      2. Kantorovich's optimization formula: Linear programming and resource allocation directly inform capacity planning and optimization tasks used in production planning and the efficient use of resources. Linear programming is a foundation for decision sciences.
         a. Kantorovich's linear programming formula: Maximize $c^T x$ subject to $Ax \leq b$, $x \geq 0$, where c is the coefficients vector of the objective function, A is the coefficients matrix for constraints, x is the variables vector, and b is the constants vector of constraints.
2. Role in economic calculation: Fundamental for determining the most efficient use of resources across different sectors and activities, employing mathematical modeling to optimize production and distribution plans in line with economic objectives.
3. Role in habitat economy: Optimizes the sustainable use of resources across habitats, ensuring efficient allocation to life, technology, and exploratory support services.
4. Example forms of linear formula are:
   i. Graph form: $y = mx + b$ (slope-intercept form).
   ii. Physical/natural unit form: Distance = Speed x Time.
   iii. Maximization form: maximize or minimize $f(x)$ subject to $g(x) \leq b$, where $f(x)$ is the objective function, $g(x)$ represents constraints, and b is a boundary condition.
   iv. Matrix form: $Ax = b$ (general form of a linear system of equations), where A is a matrix of coefficients, x is a vector of unknowns, and b is a vector representing the right-hand side constants.

B. **Statistical mathematics (correlative; statistical planning services -- statistical math):** Essential for analyzing variability and probablistics, forecasting demand, and assessing risks in production processes. Required for uncertainty and risk modeling; for handling variability, forecasting, and risk assessment. Used for risk and variability analysis. Used for modeling and analyzing the habitat service production system's structure and behavior under uncertainty.

1. Statistical formulas describe the statistical distribution of data or quantify the relationship between variables based on observations or samples. Statistical formulas express likelihoods or trends within data, not exact values. Statistical formula describe data distribution and variable relationships.
   i. Statistical formula form: Can involve statistical measures and functions like means, medians, standard deviations, correlation coefficients, regression models, and probability distributions.
   ii. Can be adapted to work with matrices: Statistical formulas adapted to matrices still deal with probabilities and variability, even when using matrix operations.
      1. Linear regression: Utilizes matrices to estimate coefficients in models relating multiple independent variables to a dependent variable.
      2. Statistical measures like mean, variance, and covariance can be calculated for matrix-valued data, providing summaries of complex multivariate distributions.
2. Example forms of statistical formula are:
   i. Traditional, sampling form: Mean production time = $\Sigma x_i / n$ (calculating the average).
   ii. Matrix form: Calculating descriptive statistics for data stored in matrices.

C. **Assembly complexity formula mathematics (compositive; assembly complexity planning services -- assembly math):** Analyzes assembly complexity and efficiency, including principles of component integration and the assembly index as a measure of complexity. Focuses on the mathematical analysis of assembly complexity and the optimization of assembly processes, including the use of the assembly index to measure and manage complexity. The formula may be used to analyze assembly complexity and efficiency, including principles of component integration. The formula becomes usable once an assembly tree diagram is constructed. Assembly complexity analysis facilitates the efficient design and delivery of services related to life, technology, and exploration services, optimizing technological and socio-technical assemblies. Used for modeling and analyzing the assembly complexity of a habitat service productions.
   1. Assembly complexity index formula: Summation (sigma) notation form.
   2. Accounting for and coordinating assembly complexity involves complexity metrics, and efficiency analysis, often focused on evaluating and reducing the complexity associated with assembling systems. This involves using metrics to quantify assembly complexity and adopting modular integration strategies that enhance adaptability and scalability. Efficiency analysis ensures that the design and deployment of habitat components minimize resource consumption and environmental impact while maximizing functionality and resident satisfaction.
   3.

2. **Simulation and computational modeling mathematics (simulation planning services -- simulation math):** Uses mathematical algorithms to simulate and evaluate (test and prototype) different resource configurations and scenarios (in habitat production), aiding in decisioning by visualizing the impact of various actions on assembly and production efficiency. Here, computational techniques are used to replicate the behavior of [economic] production systems under simulation conditions, aiding in understanding the impacts of decisions and variability without direct real-world experimentation. Simulating the habitat network facilitates demand education, service delivery, technological development, and service production.
   A. **Animated event simulation:** Useful for modeling production and usage as a series of discrete events and understanding the sequential impacts on the process.
3. **Risk analysis and management (risk math):** Involves identifying and managing potential risks in the production process to minimize negative impacts. Required for identifying and managing potential assembly-related risks. Risk analysis identifies and mitigates risks associated with habitat operations and external environmental factors, ensuring adaptive and resilient planning for life, technology, and exploration services.
   A. Statistical methods: Uses statistical methods to identify, assess, and mitigate risks associated with production and assembly processes, ensuring that potential issues are managed proactively.
   B. Linear formula: expected loss = ∑ (probability of risk × impact of risk).

1.1.1 Centralized economic production planning

Centralized economic production planning requires at least the following forms of mathematical techniques in order to effectively and efficiently allocate resources:

1. 1. Optimization techniques:
   A. Linear programming: Essential for allocating discrete resources like machines or workers, particularly in scenarios with limited quantities.
   B. Dynamic programming: Crucial for long-term planning and resource allocation across multiple periods, especially under fluctuating demand or supply.

2. Data analysis & machine learning:

2. Time series analysis: Underpins accurate forecasting of future demand and production requirements, shaping informed planning decisions.
3. Regression analysis: Reveals valuable insights into factors influencing costs, quality, and efficiency, guiding optimization efforts.

3. Modeling:
   A. Queueing theory: Helps optimize buffer sizes and scheduling to reduce bottlenecks and improve resource utilization, ensuring smooth production flow.

1.1 Structural capacity

A.k.a., Carrying capacity.

Most ecosystems (as well as commons) have a [structural] **carrying capacity**, a limit on their use beyond which the commons itself will begin to suffer decline. A forest where "commoners" gather wood will replenish itself so long as the commoners never exceed the forest's carrying capacity. The moment they do, the probability becomes that resource loss will [after a dynamically set, variable amount of time] render the non-existent of any forest in that time-space.

The concept that a given finite environment has a 'carrying capacity' is a verifiably factual understanding; carrying capacity is an empirical concept which relates the needs of a group of organisms to their environment, which may also have a set of needs. If, for instance, a group of people exceed the carrying capacity of a bridge, then they risk not having a structure [safely] under their feet. The bridge, as part of the groups spatial environment, has a weighted 'carrying capacity'; and, humans have a need for a [sufficiently] stable platform under their feet when they traverse a height.

The carrying capacity of a community's socio-economic system is dynamic. It is dynamic, in part, because it exists within a natural environment, and also, because the system depends upon its material design, which is dynamically informed by the community's iterative design. Natural processes may be used to produce surplus (e.g., permaculture) and the designed application of technology might extend carrying capacities (e.g., multilevel flooring).

As a factor in the real world cost of production and a characteristic element of every preservation strategy, the technical economic efficiency inquiry must necessarily include the *carrying capacity* of the known environment as one of its inputs. This includes (1) the carrying capacity of the community's systems as well as (2) the natural environment's carrying capacity. A carrying capacity is the maximum population size an ecosystem or structure can support. Both man-made structures and natural environments have carrying capacities - every dynamic system maintains a carrying capacity.

An inquiry into the carrying capacity of a living system asks, "With the information known, how many organisms can a particular ecosystem [or planet] support strategically [over time] without suffering severe or irreparable damage?" The answer to such a question constitutes the system's carrying capacity [in context]. Since physical structures and ecosystems are finite in their size and resources, each has an upper limit to the population that it can support. In other words, each eco-system has an upper limit to its ability to provide food, resources, maintain itself, resist damage, maintain safety, and provide the assorted ecological services that allow a given population to live and exist somewhere in sometime.

Herein, 'population pressure' is defined as the ratio between population density and the density of available resources (i.e., the resource capacity of an environment). An increase in population pressure is a circumstance that makes it harder for organisms to survive, which may be self-caused, such as high population growth, or environmentally induced, such as through a draught.

Garrett Hardin likens carrying capacity to an "engineer's ... estimate of the carrying capacity of a bridge." (Hardin, 1986) Biologists (and systems engineers in general) often use the term **thresholds** to refer to limits that, when exceeded, constitute critical boundaries within a system. As Soule observes, "Many, if not all, ecological processes have thresholds ..." In the same paper, Soule reminds us that "genetic and demographic processes" also have thresholds. (Soule, 1985)

The carrying capacity of an ecosystem is derived from a formula involving a variety of physical-ecological (environmental) variables. The variable set includes, but is not limited to environmental media (e.g., water, soil, air, energy and physical size) and the periodicity of resource regeneration. Such a calculation involves the tracking of systems change, and the regeneration of resources, over time. Tracking of resources is necessary for a system to remain in a state of dynamic equilibrium (or 'threshold effect') so that resources are available as desired (i.e., for access abundance). If a community uses up trees in their habitat faster than they grow back, then the community has a serious life-support problem emerging, for such an action is unsustainable and reaches beyond the carrying capacity of the habitat. Herein, transparency and resource tracking facilitate the ability to optimize an economic fulfillment system.

The physical-ecological information set comprises all fixed and flexible components of the natural and human-designed environments, including the habitat service system infrastructure. The *fixed* components refer to the capacity of natural systems expressed occasionally as *ecological capacity*, *assimilative capacity,* etc. They cannot be manipulated easily by human action and to the extent these limits can be estimated they should be carefully observed and respected as such. The *flexible* components refer primarily to our designed 'service support' systems (and their characteristics) like water supply, sewerage, electricity, transportation, social amenities, and other services. The capacity limits of these systems are improved through greater knowledge and understanding, and technical production efficiency.

In other words, carrying capacity exists, and a carrying capacity can be synthetically extended through increases in the efficiency and effectiveness of technological integration.

Please note that the carrying capacity calculation requires the continuous surveying, monitoring, and tracking of physical resources (i.e., it requires *Resource Inquiry*). In a 'global access system' all resources are tracked in a transparent manner such that every individual in the community has an awareness of the availability of a resource and acutely understands the implications of its re-allocation (or "consumption").

The structure of a system limits its capacity. There is only so much that can be done to increase capacity, beyond that the structure must be re-designed. Wherein, when function is lost, so is capacity.

There are three distinct levels of optimization:

1. Optimization within the structures (or system management.
2. Optimization of the systems structures (or system design).
3. Optimization of the context structures (or global system design).

Regulating the process of generating fulfilling goods and services is the process of 'systems coordination' as the organized rearranging and replacing of tools and components, which is necessary for all forms of optimization Herein, the integration of a system among a community of individuals for commonly optimized access is known as 'global system design'.

> **NOTE:** *In a sustainable economic design model, the rates of natural regeneration must be accounted for.*

1.2 Computational capacity

A.k.a., Computational inquiry resolution

This inquiry space is designed to calculate the technical feasibility of a solution via an inquiry and a "triggering" threshold. Herein, the economic efficiency inquiry assesses the designed solutions for their placement along a technical optimization and preservation spectrum. The spectrum maintains a formally set, qualified and calculable, triggering threshold. When this threshold is reached, then the issue as it is presently solved for (by inquiry into the current design specification) does not "pass" this inquiry process, and therefore, requires a structural or material redesigned with different resources or fewer real world costs. This inquiry process asks if the proposed solution is technically feasible:

1. The solution doesn't significantly impact the resource requirements of other priority issues.
2. The solution is "structurally sound" given what we know of the system and its material's composition.

For humans, exceeding the carrying capacity of their environment is likely to lead to environmental challenges as well as a wide-variety of social and behavioral problems that fundamentally do not support an evolution toward a higher potential form of life enriching experience. Hence, resources can only be used at a rate that they can be adequately renewed. The sustainable management of a community's resources is integral to the survival of the community, and their equitable allocation is integral to social stability. Resource regeneration must never dip below what is sufficient for each system, particularly the core systems, if the community is to sustain a state of dynamic equilibrium, and maintain a common level of basic fulfillment.

The economic efficiency inquiry is essentially a preservation strategy that is logical founded upon the empirical processes of biological preservation and technical [structural] efficiency, which can only define true human sustainability; leading to a greater potential for access abundance and material freedom in our designs. And, a reminder, that material freedom (i.e., a more thought responsive environment) comes with a different value set.

By calculating the total cost of an issue's resolution as its impact on other economic inputs and outputs (e.g., true cost economics), then this inquiry process presents the community with an economic adaptation mechanism that objectively and cohesively visualizes all possible alternative options for the allocation of resources toward the resolution of an economic issue. And, that information can be processed to select for a solution that indicates the highest community optimization and preservation based on an informed and formalized feasibility threshold. Herein, *optimization* refers to the selection of a solution that has the lowest resource cost/requirements relative to other needed and formally prioritized goods and services.

> **NOTE:** *An infinite-grow paradigm [on a finite planet] is unsustainable.*

1.3 Optimizational capacity

A.k.a., Optimization inquiry resolution, pareto efficiency, pareto efficient optimization, optimal distribution.

A pareto-efficient distribution of goods based on individual needs, preferences, and available resources. Pareto efficiency, named after the economist Vilfredo Pareto, refers to an allocation of resources or goods in a way that no individual can be made better off without making someone else worse off. It essentially suggests that a distribution of goods is "Pareto" efficient if there is no way to reallocate those goods that would improve the well-being of at least one person without reducing the well-being of someone else. A pareto-distribution is optimal if it is impossible to improve anyone's condition by modifying the distribution of goods, without making someone else worse off.

More completely, achieving Pareto efficiency in the allocation of resources to fulfill human needs means that the distribution is such that no individual's fulfillment of needs can be increased without reducing the fulfillment of someone else's needs. In other words, achieving Pareto efficiency in the distribution of common heritage resources to human need would mean that the allocation is at a point where no one's basic needs can be better addressed without sacrificing the ability of others to meet their own basic needs. Pareto efficiency reflects an allocation where resources are distributed in a way that maximizes the fulfillment of human needs without worsening anyone else's situation. It emphasizes an optimal distribution where no one's needs can be improved without negatively impacting someone else's ability to meet their own needs.

Pareto-efficiency is a desirable property of an social economic production system. In the context of individual needs and preferences, and goods distributions, achieving Pareto efficiency means that the allocation of goods among individuals is at an optimal point where no one can be made better off without making someone else worse off. This doesn't imply that everyone is equally well off, but rather that the statistical distribution has reached an optimal state given the needs, preferences, and resources available.

It is possible to imagine Pareto-efficiency optimized situations. Imagine a situation where there are two individuals, A and B, and a certain quantity of goods (like food, clothing, etc.). If the total goods are re-distributed in a way that increases the amount of goods for A without reducing B's goods, or vice versa, that new distribution would be considered Pareto improving. However, if A cannot be made better off without making B worse off, or vice versa, the current distribution is said to be Pareto efficient. Pareto efficiency is a desirable property in economics because it signifies an allocation of resources where no one can be made better off without causing harm to others. It's considered a benchmark for economic optimality, though achieving it in the real world can be challenging due to various complexities, market imperfections, and conflicting intentions among individuals.

1.3.1 Market pareto rule

A.k.a., Market pareto rule.

Pareto efficiency ought not be confused with the "market pareto rule". The market "pareto rule" is especially relevant in business and government. This "pareto" rule that says that these structures (market-State) are likely to form organizations of people in the ratio of 80 to 20 (80:20). The pareto rule is more often seen with larger organizations, with larger populations of people .Eighty percent of the people in the organization will be dedicated to one type of issue (e.g., the survival of the organization), and twenty percent will be dedicated to the actual mission of the organization (e.g., making a product). In the pejorative sense, twenty percent of people are doing the actual work (or 20% of everyone's time is dedicated to actually useful work), and eighty percent of people are working to support the management/owners of the organization (80% of everyone's time is dedicated to non-useful work).

1.4 The economic calculation problem

The economic calculation "problem" is a contextual criticism of economic planning in favor of price and market-based allocation organizations. In the market, economic calculation involves adding up costs in terms of money. By viewing society as an information system with key sub-systems, one of which is a decision system, it becomes possible to see that through the use of project planning and systems engineering actionable lists are made available from which objective measures of progress are determinable. Economic calculation and planning are possible when there is contribution within the context of different habitat configurations of common heritage resources, and a system for useful calculation. In order to calculate an economic plan, a society requires accurate data on resources, knowledge, and expectations. Economic calculation occurs in the market in a similar way to community, but in community, the entities who are accountable for economic planning are cooperating and not competing. The economic calculation problem was given by Von Mises and latter built upon by Hayek:

1. Misesian argument: This focuses on the challenge of economic calculation in socialism, arguing that without market prices, it's impossible to make rational economic decisions regarding resource allocation.
2. Hayekian argument: Emphasizes the dispersion of knowledge and the complexity of economic coordination, arguing that a central planning body cannot possess all the dispersed information necessary for efficient economic planning.

The basic argument is that:

> *Rational economic decision-making (about fulfilling wants, "consumer" preferences) is not possible without the price signals provided by genuinely competitive markets based on private ownership of the means of production, investment on the basis of profit-maximization, and market supply-demand price.*

The economic calculation problem is a criticism of central economic planning and planning without price. The "problem" being referred to is that of "how to distribute resources rationally in an economy" without market prices. The free market solution involves something known as "the price mechanism"; which is itself a claim that "people individually have the ability to decide how a good or service should be distributed based on their willingness to give money for it". Instead of proposing a contextualized problem, the claimed "economic calculation problem" argues that the "price mechanism" is the only possible means to understand how to "efficiently" create and move goods around an economy.

The controversy over socialist-type economic calculation (a.k.a., the economic calculation problem) dates from a split in the Vienna intellectual community in the early 1920s. On the one side was Neurath who had become a strong "socialist" who was adamant that a socialist economy had to be moneyless. (Cockshot, 2018) On the other side of the argument, against a moneyless-type society, were Mises and Hayek. Neurath had argued for a "socialist" economy in which calculation in-kind replaced/obsoleted money. Mises response was to simply state that such calculation was impossible and irrational. Neurath's argument become the "left" or "left wing" case, where societally could be optimally organized according to knowledge, resources (and human effort), and human needs; on the other hand, Mises and Hayak became the "right" or "right wing" case, where society could be optimally organized based on property, trade, and possible regulatory assurance organization (Read: a State or State-like entity).

The economic calculation problem makes the claim that price can be, and is, the ultimate mediator of decisions in the market; which, is a truism for the organization of an economy as a market. Notice the continuous presupposition of the presence of a “market” in the description of the problem itself. The economic calculation problem is a market problem, if it is in fact even a problem. In other words, if the economic calculation is a problem at all, then it is a problem with a specific form of economic organization known as “the market”.

The economic calculation problem put forward by Mises states that without a pricing mechanism there is no way to rationally allocate goods and services [in a market], wherein ‘price’ acts as the data point that communicates to the market [system of consumers and producers] how much to adjust their production levels in order to meet demand. The assumption (or assertion) that market advocates take as though it is an axiomatic principle of logic is that demand and distribution cannot be computed (or calculated) without price.

In other words, the economic calculation problem as it is described can only pertain to a trade economy, it is de-contextualized from other (or different) relationships to the natural world. The economic calculation problem has no reference for the existence of an economy not based on the trade of goods and services in a market. Essentially, the language which created the claimed “problem” can’t be used to understand the actual problem. It is necessary to have integrated an understanding of systems thinking as a tool if one is to critically comprehend why the economic calculation problem is the problem of a particular socio-economic structuring, and does not necessarily apply to other structural organizations. It is the use and the framework of language in the question that imparts a misunderstanding about the essential issue - the economic fulfillment of human need.

The economic calculation problem may in fact be a valid criticism of a “centrally planned market”. There is some degree of competition in every market; hence, there is some artificially enforced degree of opacity to the acquisition of information; hence, there is some noise interfering with a purposeful plan [to distribute resource “rationally”].

Traditional market thought argues that the dynamic variability of human interests make it technically impossible to “calculate demand” without the “price mechanism”. While this may have been somewhat true in the early 20th century when these claims were made, the age of digital computation and information calculation, systems thinking and design engineering, coupled with the functional extension of ourselves through (sensing and tracking) technology, humankind has commonly removed this barrier to the obfuscated realization of complexity in the natural environment.

1. **Price negotiates** decisions in the market. Negotiations occur between, competing and otherwise opposing, forces.
    A. *Profit* is an encoded value (there is *profit value system - the value system of a market-State society*).
2. **Individuals in a community account** for information and calculate (or compute) the most effective and efficient means of freely fulfilling their needs. The accounting and calculation of information in a system necessitates cooperation, a synthesis of forces. Calculation notes the degree of accountable efficiency in a cooperative relationship.
    A. *Use* is an encoded value (there is *use value system - the value system of a community-type society*).

In market-based thought, “price” takes upon itself (Read: assumes) “subjective human whims” and converts them into “objective numerical values” creating a state where all “heterogeneous goods” can be “objectively” compared; thereupon, a vase can be compared [in price] against a bottle of water [in price]. Price is an arbitrarily subjective and utilitarian value placed upon owned[-able] property [with some sprinkling of labor energy and scarcity reflected in price, though they are obscured by noise].

1. What are “subjective human whims”?
2. What is this conversion taking place?
3. What is objective?
4. How are numerical values derived from a subject?
5. What is meant by “heterogeneous goods”?
6. What is actually being compared?

The “signaling function” of the market (i.e., price) is erroneous because it does not separate the noise from the signal; and hence, it cannot facilitate orientation in an intentional direction through a common environment.

Price is subjective; it redirects our individual relationships away from nature, away from that which is. It is not a rational measure for the prices themselves are subject to the very market they claim to rule; price is subject to the systematically generated and reinforced value characteristics of its overall structure, competition being one of its principal value coordinates. The price mechanism is subject to all kinds of distortion; it is a bunch of noise with a façade of advertising and marketing [so that it “slips down more easily”] ... and once swallowed whole it is challenging to get out. Fluctuations in the price of goods and services in the market can kill people. Do we really want to organize a society around the market and around price? The price mechanism itself is the arbiter of decisions in the market.

There are going to be people who can't find a way to make a life for themselves within the market system; it is an inevitability due to the structural design of the market system itself.

The price mechanism has an inherent tendency toward personal maximization at others expense, monopolistic collusion, hierarchical dominance, and the need for waste and scarcity. The price mechanism leads to pockets of poverty [in the self and in others], and it is not an effective or efficient way of ensuring the persistence of a system that maintains individuals access to the resources, goods and services, that they need to survive and thrive. Price removes the idea of intentional design and of intentional orientation in a knowable and common territory.

The price mechanism is an element in the generation of unsustainable cultural and environmental environments in the market. The market is the real tragedy of the commons: the commons exists, the market doesn't. The tragedy is that the belief in the market leads to the destruction (de-structuring) of common natural services [provided in appreciation by the Earth]. Competition between market entities pricing property generates a state of excess consumption and mismanaged (e.g., unsafe) production in what would otherwise be seen as area for the caretaking of what are natural, common services for all life on the planet. Fear consumes life; fear will de-structure and de-cohere the flow of information from a source [of consciousness]. Prices never tell the truth. Prices are full of tricks, and those tricks do harm. Price is a non-rational force. Some societal systems produce value disorders that prop up false demands .

The idea that price is rational to begin with is incorrect. The way that price manifests is not necessarily a rational act. The random irrationality of demand can falsely create high prices. Someone could buy a load of copper tomorrow and it would make the price of copper rise. De Beers, to use a continuing historic example, could market or conceal diamonds (Epstein, 1982) in a way to control or falsely inflate the price of diamonds. Or, they could flood the market with diamonds and drop the price. Price, in the national and international markets, is not connected to use-value, at all.

'Use-value' refers to the value a user get from the functional use of a product or service or system; which due to modern electronic automation technology is now becoming 'production value' - the ability to create goods and the ability to be an "owner" of a particular mode of production. For example, 3D printers are products and producers at the same time. This understanding has led some economists, most notably Jeremy Rifkin (2015) in his book "The zero marginal cost society" to assert with evidence that society in the near future will no longer be composed of producers and consumers, but will instead involve "prosumers" (i.e., consumers who have become their own producers; users that design their own systems -- a prosumer is an individual who both consumes and produces). In essence, as we produce more data about how our services should be produced the market system becomes increasingly obsolete since "prosumers" are capable of producing things at zero-marginal cost. 3D printers are just one example of such a fundamental, socio-economic structural modifying, technology. Note here that the term "prosumer" is a market-based term.

Does price tell us anything about the actual nature of copper or its uses – what scientific instrument can we use to investigate copper to find its intrinsic use value? Instead, the movement of a commodity and the discussion surrounding a commodity is reflective of market behavior, quite possibly, to manipulate the price of the commodity (or securities investment) in the market for financial or some other gain.

Economists use the term "inelastic demand" to refer to things that "you", as a human organism, have to have in order to survive - they are not temporally flexible demands, they are knowable, persistent, and have common durations between when and under what conditions they need to be filled. But what if someone were to own the resources required for the fulfilling of these "inelastic demands" of a given population. If someone owns what are essentially life-ground needs (and maintains a [police/military] group to fight for and defend that ownership), then that person is going to have a tremendous amount of control over other people's lives. Some "economists" then go on and make the claim that a system which has "inelastic demands" and uses the force of police and military to maintain the persistence of human fulfillment is a truly voluntary system, which is highly disingenuous. To the common people, such a system isn't voluntary, if "voluntary" means the synergy of conscious intention, volition and participation without structural coercion or social manipulation.

Without advertising and marketing, without the forceful conditioning of competing market entities, it becomes far easier to look at the landscape ahead of us and calculate what we need. If we create a society that venerates and encourages the cultivation of the cooperatively safe, effective, and efficient use of resources based on [at least] fulfilling evaluations and corrective feedback, then we might begin to arrive at community.

There is no such thing as "perfect" per say. The term "perfect" information is not only meaningless, but it paralyzes consciousness by embedding the idea of a fixed status or standard in one's relationship with the world. Perfection is the lowest standard; it is a standard of zero. Perfection is the lowest standard you could possibly have because it isn't a possible standard, it is not achievable. Perfection represents the negation of emergence. In systems thinking, information is emergent, not perfect. In the mentality of "the market" there may exist the idea of "perfect" information, but in the real world, systems are designed and re-designed, "perfect" information is neither a useful nor an accurate idea.

The claim that there is "no way that anyone can get all the information they need in order to arrive at an economic decision", is a highly confused claim. What does it mean to "arrive at an economic decision"? What information is needed? What does it mean to "get all the information"? And, just who is "anyone"?

The price system is a way of communicating among the market, but in a family environment, there are better ways of communicating. Family members tell each other what they need and what they want, and they coordinate and cooperate from that point forward. Is it unwise to use the price system and open competition to manage a household or manage loved ones. Awareness of access and availability pervades; the family knows what is and is not possible. Learning about reality is foundational. The price system is a mechanism of communication and today we have better mechanisms of communication. We have computational processing technologies that may extend the functioning of our minds to more efficiently organize our economies.

The presupposition in the economic calculation problem is that the market does what it is claimed to do, to translate individual "subjective" values into "objective" information necessary for the "rational" allocation of resources in society. To a community, rational allocation is allocation toward human fulfillment.

Is it possible to facilitate feedback with respect to consumer preference, demand, labor value, and resource (or component) scarcity without the price system, subjective property values, or exchange? Just eliminate exchange and cooperatively create a direct control process and feedback link between the consumer and the means of production itself - a participative, real world habitat system. The consumer becomes both the user and the creator of the "means of production", and the infrastructure becomes nothing more than a tool that enables access by the community to the re-generational design of our habitat fulfillment services.

The same information technology systems that are being used in the market today would be used by the systems in this Community. Companies in the market this very day are using information technological services to calculate the production of their products and services in real-time and on-demand through both vertical [business integration] and horizontal [customer integration of information tracking and acquisition] utilizing live feed information and technical feedback. Society is now at a stage where its technological infrastructure is so superior to the technology possible conceived of when the economic calculation problem was thought up. Information technology is now to the point that individuals can share in real-time what is being consumed, and how and when and where and why, and its environmental effects such that humanity has the information available to re-orient itself when desired toward a direction of higher potential fulfillment.

Through measurement, society can process information into numerical correlation, and with that calculation process, done by complexly designed processing computation systems, a community can arrive at an optimal resource allocation and material decision for a given demand at a given point in time - this is true economic calculation.

The framework of thought that poses the economic calculation problem cannot conceive of a process of commonly formalized inquiry and re-engineered design [with transparent, real-time information feeds and fully automated production tools] to rationally fulfill identifiable, real world human [economic] needs. The problem was conceived of through the lens of a politically-organized social system and a market-structured economic system. The problem here is the conceptual framework of thought used to construct the "problem".

Price is determined within the market, which encircles itself [from externalities*] and produces its own structural values. Price isn't determined with conscience [as con+science] in mind. If a society wants to resolve the economic calculation problem's claimed "problem" of determining value, then it will have remove exchange explicitly [from its socio-economically encoded language]. In place of the "price mechanism" a society might use information systems and technology to "produce" a fulfilling environment for the whole [Earthly] community.

Given community standards in conjunction with the information, communications, and computation systems available in the early 21st century, it is entirely feasible to compute plans for local habitats within a global resource-sharing habitat network using available information technologies and societal engineering models (for a community-type configuration of society):

1. **Societal technological basis/structure:** Proposes using modern information system technology for economic calculation ("cybernetic") planning, allowing for the collection, processing, analyzing, and deciding and utilization of dispersed economic information in real time, effectively addressing Hayek's concern about knowledge dispersion.
    A. The existence of formalized algorithmic thought, as verifiably evidenced by technology, is a component of the solving of the "economic calculation problem"
        1. ... if the idea of a formalized algorithm is understood.
    B. Scientific-technical coordination: Uses a synthesis of calculation in-natura and in-kind, including labor time, mathematical optimization, and linear alegraic input-output, matrix methodology, which addresses completely the Misesian calculation problem. In community, production units provide technological (habitats) and information (databases and intelligence) to users by contributing their labor life-phase time, as a duty-in-service to all.
2. **Societal information basis/structure:** Suggests creating a decentralized physical habitat

constructed through a unified and integrated societal standard involving global and local planning and decisioning mechanisms. Buy understanding any configuration of society as composed of four fundamental conceptual systems, it is possible to use that model to design and intend a direction for society, and oneself therein. Conceptually modeling society within a set of standards that explain its operation and define the fundamental means by which human sustainably meets its needs effectively addresses Mises concern about the impossibility of making rational decisions without price. Here, the rational decision given access to all available information is optimize the fulfillment of human need.

A. The ability to account for human need as verifiably evidenced by what is required for survival and flourishing, is a component of the solving of the "economic calculation problem"
   1. ... if the idea of a real-world human need is understood.
B. The ability to visualize concepts in the form of a model (Read: concept model, vector database graph), as verifiably evidenced by images of concept models and large language models, is a component of the solving of the "economic calculation problem"
   1. ... if the conceived ideas are visualized and rational linguistic intelligence is applied.
C. Project coordination (a.k.a., project management as a discipline) conveys the ability to organize and plan projects involving a global network of projects involving users and contributors, as verifiably evidenced by successful implementations of large-scale projects across various sectors of the global economy. This is a component of solving the "economic calculation problem" if efficient and dynamic project management/coordination practices are integrated, allowing for real-time adjustments and optimizations based on evolving project needs and external conditions.

The interplay between human needs, concept visualization, and project coordination underscores a multi-dimensional approach to addressing the economic calculation problem. Each component contributes uniquely to the overarching goal of achieving an efficient, responsive, and needs-oriented economic system. By understanding real-world human needs, visualizing complex concepts through models, and applying disciplined project management, it becomes possible to navigate the challenges of resource allocation and economic planning in a manner that is both practical and aligned with human well-being. This holistic approach leverages the strengths of human intelligence, technological advancement, and organizational skills to resolve pathways toward solving one of the most persistent challenges in economic theory; which is, how to organize the economy of society toward community?

In the market economy, it is true that there is no "perfect information" because between competing entities there is not trustworthy transparency; no one really knows the depth and breadth of scarcity because of State and business secrets and unrevealing public narratives, because of competition and hierarchy. Hence, no one can actually trust any figures that are published by market entities, nor can anyone say that the market in any way accounts for scarcity in price figures. Scarcity is not quantifiable in any price; because, of the existence of competition and trade advantage in the market. For their very survival, market entities and producers withhold information or narrate over information that would otherwise cause their customers to shop at a competitor.

In a community there must exist:

1. Absolute transparency of all resources.
2. The value of sharing information for common benefit.
3. And then,
   A. A community uses its intelligence and resources to create formalized societal standards and systems involving cybernated algorithms, which account for resource scarcities and and compute resources thresholds. Logical calculation is a particular form of integration.

Every material [resource] is an object with a quantity of mass/matter. That quantity of mass-matter resources has a set of sensory-identifiable qualities, forms (structures), and states. For example, copper and other metals maintain the property of conductivity [of electricity] with different degrees (i.e., qualities) of efficiency. Materials can be compared by their quantity of matter (in-natura) and unit measurements (in-kind) using calculation.

It is possible to calculate a new orientational state based upon information in the total information system, and particular, the demand present in the decision system. A 'calculation space' is a mental (or computational) spatially-oriented and relational process that relies on the application of rules (programmable instructions) for the selection of one abstract object/entity from a given set of abstract/conceptual objects. It can either be reasoning-oriented (i.e., evaluation) or action-oriented (i.e., decision). Calculation accounts for referential information; the market de-references information creating pockets in our hearts and our souls.

The economic calculation problem claims that only a free market can determine an accurate price for economic goods because only a group of decentralized consumers projecting their subjective value into the market through the materialization of “price” is capable of organizing human socio-economic arrangements. The embedded claim is that there is no other way to end up with a “fairly accurate representation of how desirable something is” and “how scarce, rare or abundant it is” without the paradox of a subjectively objective price. The claim within that is that there isn’t enough information input possible to determine and calculate production. Yet there is, it simply isn’t transparently available at the moment because of the materialized acceptance of the market as the means of human fulfillment.

> **INSIGHT:** *If you don’t understand all of the pieces you aren’t likely to understand the system.*

The economic calculation problem is almost a Luddite fallacy in clever disguise. The Luddites were 19th-century English textile artisans who protested against newly developed labor-saving machinery (i.e., technological automation) from 1811 to 1817. They did actually lose their jobs and were maybe ahead of their time in saying that everybody would lose their jobs to the exponentiation of efficiency of information technology. The exponential development of information technology will change the labor-productivity landscape forever; it is inevitable.

Fundamentally, the economic calculation “problem” exists in a different kind of thought paradigm than that which acknowledges the value of an access-based, transparently information rich, systematically understood and anticipated environment. The language which created the claimed “problem” can’t even be used to understand the actual problem.

Cybernation has come to mean many things to many people. However, herein, it is defined as a formalized control process that feeds information from the results of its actions in an environment back into itself so that it can correct its trajectory [toward our most fulfilling purpose - the highest potential fulfillment of human need and well-being].

> **NOTE:** *Economists refer to the natural ecological services of the Earth as “externalities” (i.e., they are external to their market calculations).*

1.4.1 The economic rationality problem

When Mises speaks about economic rationality, he had in mind the problem of producing the maximum "useful effect" (defined as satisfaction of wants, consumer preferences) on the basis of a set of economic resources. Mises framed the problem in terms of its core: how to create the most efficient form of production in order to minimize resources used to produce a given "useful effect" (Read: "want" satisfaction). Market economists typically do not define their idea of a "rational" economy as it operates in the real-world, based significantly on the relationships between the incomes of different social classes (i.e., political economy production and access). Mises claims is that only trade with money (a market with money), by reducing all costs and benefits to the common denominator of "money" (Read: price of private property), can there be a rational comparison of alternative possibilities, alternative plans/ways of carrying out production. (Cockshot, 2018)

Mises' question to "socialist" economic planners was, "How can the planning system calculate the least-cost method of achieving human objects (i.e., a railway or house)?" In the literature of Mises, he goes through a series of ways in which a planner might calculate the least-cost method, and rejects them all. He starts out rejecting Neurath's proposal of calculation in-kind on the basis that it is impossible to add together quantities of different inputs, unless they are first converted to a common unit of measurement, such as "money". In other words, Mises states that there is no rational/possible way of combining inputs (into a single means of production) unless all of the inputs can be "costed" in terms of a single unit like "money". However, this argument is false. Kantorovich's work using linear programming shows, on the contrary, that in-kind optimization without money is feasible provided that there is a defined plan target (e.g., a 2 or 5 year plan target). Kantorovich’s work showed that it is possible, starting out from a description in purely physical terms of the various production techniques available, to use a determinate mathematical procedure to determine which combination of techniques will best meet plan targets. These linear techniques demonstrate that in-natura calculation (using natural units) is possible, show that a non-monetary scalar objective function is possible (as in, the degree to which plan targets are met). (Cockshot, 2014) Kantorovich even got a Nobel Prize in economics for proving this mathematically. Kantorovich's optimization procedures do not depend on monetary calculation; they only require knowledge of technology, knowledge of mathematics, accounting for used services and service objects, and a planned target. (Cockshot, 2018)

Describing his discovery, Kantorovich wrote (Kantorovich, 1960, p. 368):

> *I discovered that a whole range of problems of the most diverse character relating to the scientific organization of production (questions of the optimum distribution of the work of machines and mechanisms, the minimization of scrap, the best utilization of raw materials and local materials, fuel, transportation, and so on) lead to the formulation of a single group of mathematical problems (extremal problems). These problems are not directly comparable to problems considered in mathematical analysis. It is more correct to say that they are formally similar, and even turn out to be formally very simple, but the process of solving them with which one is faced [i.e., by mathematical analysis] is practically completely unusable, since it requires the solution of tens of thousands or even millions of systems of*

> *equations for completion. I have succeeded in finding a comparatively simple general method of solving this group of problems which is applicable to all the problems I have mentioned, and is sufficiently simple and effective for their solution to be made completely achievable under practical conditions.*

Mises presents the labor theory of value, and rejects it in a single sentence:

> *"This suggestion [the labor theory of value] does not take into account the original material factors of production and ignores the different qualities of work accomplished in the various labor-hours worked by the same and by different people."*

The rejection that there are different material factors of production may itself be rejected since it is possible reduce the material factors of production to:

1. **Labor (in-natura units)** - work time (reasoned by Ricardo and Marx).
2. **Resources (in-natura units)** - materials (informed by science, material science).
3. **Habitat services (in-kind units)** - human fulfillment socio-technical service support sub-systems of life, technology, and exploratory (involves in-kind calculation and urban planning working groups).
   A. **Access as a service** (demand units) - access to socio-technical services and objects in existing locations (Read: habitats) by existing users through personal-access, common-access, or, team-access.

Further, the rejection that there will be significant differences in the quality of work among habitats (producers) itself may be rejected when considering the development and application of a unified and optimized community standard for all operations, and the engagement of intrinsic motivation (versus extrinsic reward).

In concern to the different material factors of production, Mises confuses "concrete" labor with "abstract" labor, which is a distinction originally proposed by Marx. "Abstract" labor refers to human labor for market exchange (i.e., exchange value or valuable worktime for market economics) versus "concrete" labor, which refers to human labor for a specifically and directly useful (final user) service/effect or object. All "concrete" labor is reduced to the common social data ("substance value") of labor time and direct human need fulfillment. In Marx's theory, an hour of work counts as value (i.e., is a count of value); insofar as it is a fraction of the total time available to society to do work. It does not matter if the "concrete" labor time is spent fabricating something or monitoring something, from the standpoint of social total human cost, it is human effort. In the market-State, abstract human effort is a (large) portion of society's labor time. Behind the scenes in Mises objection was a hidden bias. All people in society are humans with universal needs, there are classes of people with preferences and qualifications for contribution).

Mises rejects the suggestion that the "unit" of measure be 'utility' (user usefulness) on the grounds that this is not directly measurable. Market economists, the societal category-type Mises fits in, defines utility as a measure of: 1) capitalist profit (profit utility); and 2) the satisfaction received by buying and consuming goods and services in the market (consumer utility, "want-satiation"). Under market conditions, utility is a social construction, not a personal user selection. Utility is a social construction under market conditions because it is based in market exchange and the "wanted private property" (not needed or preferred access) consumption of goods and services in a market, which is an abstract concept. It is not possible to operationalize the market; doing so would be a reification (and yet, the market is all around everyone in early 21st century society; it is in the heads and minds (mental operationalizations) of most everyone. In a community-type society, however, utility can be operationalized based on human needs, material resource characteristics and availability, habitat services (derived from universal human needs), and user [f]actually stated fulfillment. Utility, from a user's perspective, means to meet functional and non-functional expectations, and is often objectively experienced by someone's emotional state of completion, pleasure, need satisfaction/fulfillment, and/or objective well-being.

Mises rejects the market "socialist" approach (socialism as State ownership) to production on the grounds that the market is essentially the pursuit of self-interest. For mises, there cannot exist market-based "socialism" with State ownership (of production) and a market (trade-price) operation; because, a market is essentially the pursuit of self-interest. Because the market is the pursuit of self-interest, Mises claims that the "entrepreneur" (business owner) is absolutely necessary. In other words, Mises claims that risk taking "entrepreneurs" (business owners) are required for efficient operation of an [market] economy.

It is possible to plan how best to use current resources to achieve a given future output. The multi-year plan methods show that it is, and there are well-defined mathematical techniques for economic planning. Mises also rejects the method of trial and error (prototyping).

Mises continually concentrates on the alleged impossibility of apply algorithmic methods (arithmetical techniques) to comparing inputs with outputs in the absence of markets (trade, exchange, money) for the means of production. Effectively, Mises states repetitively that there cannot just exist a market for consumer goods, there must also be a market for producer goods, otherwise the optimal market calculations cannot be complete.

The Austrian School of Economics are significant, because they provide a key part of the libertarian ("free" market and property only) argument against "socialism" and a community-type society. The Austrian School of Economics are the start of a competitive, property-based economic system; and hence, an argument against them can clarify and make more robust the argument for operation of an economic system based upon cooperation. Mises was the first of the Austrian Economists to be involved with arguing against societal economic planning through calculation. Later in historical time, Hayek as an Austrian Economist argued against societal economic calculation planning also.

Von Mises claims:

1. Only money provides a rational basis for comparing costs.
2. Calculation in terms of labor time is impractical because of the millions of equations that would need to be solved.

Hayek:

1. Market is like a telephone system exchanging information optimizes economic production.
2. Only the market can solve the problem of dispersed information [because it operates at the speed of the telephone].

Scale of problem:

1. In the mid 1950s, GOSPLAN (Soviet Union. Established in 1921, Gosplan was the central economic planning agency) could prepare detailed material balances for some 3,000 products, and had some control over a further 30,000. (Dobb, 2008)
    A. By the late 1960s, there were several million distinct products involved in the whole Soviet economy (Economics of feasible socialism, A. Novel). This was more than could be handled in detail by the existing GOSPLAN staff of 3,000-4,000 people thousand people. Suppose each of 1 million products uses say an average of 200 other components in its direct manufacture. It is possible to describe each production process as a list of pairs:
        1. Product code of input, amount of input. Product code of the input, combined with the amount required to produce one unit of output.
            i. With each product code pair taking 2 full words of computer memory.
            ii. For a million products, there would be a requirement for a minimum of 400 million words of memory to do planning or compute labor values - say around 1.5 GigaBytes.
    B. Ideally, it is best to have the 1.5 GB of data in [fast] RAM, but it is also possible to use hard disks.
        1. The best United States technology didn't reach this level until the mid 1970s. By 1975, CDC in America was building 300MB drives, but these were embargoed for the USSR.
    C. In addition, there is a requirement for >1 million words of [fast] RAM.
        1. The best US technology did not reach this level till 1975 (CRAY 1).
        2. Four 1975 models of CDC drives could have held the information to computer 1 million labor values.
    D. During GOSPLAN money was still being used for wage payments, which led to black markets, corruption, and the constant pressure to rationalize and replace planned production by market production, which led to Peristroyka, and eventually, the rapid destruction of the planned system. Although the Soviet system did use some computers, they computers were not sufficient and they had to rely on money for economic calculation, even in the planned sector. Effectively, soviet socialism could be characterized as having:
        1. Money still needed for economic calculation even in the planned sector.
        2. Problem of aggregation in planning required monetary objectives.
        3. Inability to handle disaggregated plans at all levels.
        4. Insufficient computation. To work out the labor content of every good required the solution of millions of equations. 1960s computes were not powerful enough.
        5. Money still needed for wage payments.
2. In a series of papers, Allin Cottrell, Greg Michaelson, and Paul Cockshot have shown that the computational complexity of computing labor values for an entire economy with N distinct products grows as N log(N). The number of iterations required for Gaussian elimination on a matrix of order of 10^{18} arithmetic operations. Assuming the Fujitsu VP 200 supercomputer can perform 200 million arithmetic operations per second, calculating all the labor values using Gaussian elimination for an input-output table of this size would indeed take a substantial amount of time. The calculation provided (50 billion seconds or approximately 16,000 years). Where the fujitsu VP 200 supercomputer is replaced with

an modern xeon chip and an H100 graphics card using the same formulas would complete the same computation in minutes; because it can run tens of billions of operations per second.

A. Computation is the computer execution of a mathematical model, whereas simulation mimics a process or a system. It is possible to execute a mathematical (linear algebra) model that performs sufficient computations to simulate an economy in a reasonable amount of time with (showing dates, and, how many products could be computed for at that date):
    1. 1980s: 600,000 products.
    2. 1989s: Machine with a capacity of 10,000 million instructions per second.
    3. 1990s: 1 million million operations per second.

B. Key developments in productive forces since the 1960s include, but are not limited to:
    1. Internet - allows real-time cybernetic planning and can solve the problem of dispersed information (note: this was Hayeks key objection).
    2. Database technology - allows for the aggregation of information needed for planning.
    3. Computers - can solve the millions of equations in seconds (note: this was von Mises objection).
    4. Electronic payment cards - allows replacement of cash with non-transferable labor credits.
    5. Machine artificial intelligence - allows data collection, analytics, and decision support at the common wealth of nations level.

3. In 2021, Amazon corporation runs logistical calculations and decisions on millions to billions of products with modern CPUs and GPU arrangements. The computation of labour values, assembly indices, and all community [free access] information is available in the early 21st century for a planning a whole economy feasibly in a few minutes using modern supercomputers. These computers are expensive, but not prohibitively so. They are already used for artificial intelligence training, visualization, weather forecasting, astronomy, etc. In this event, a cooperative/ State (planning/statistics) organization buys one of these systems (or access to it). Until recently, supercomputer technology has been within the capability of a only few States (with export controls).

Social "socialist" planning organization knows:

1. The labor contents of the all the different means of production.
2. The labor contents of all the end personal and common user products (and services, habitat services) themselves.
3. The number of labor tokens (State credits) that each consumer of an object-service will fetch from its executed priced-sale in the State ("commissary") market to individuals.
    A. All products sold in the market of the Sate are produced by the State (one office, one factory).
    B. Some products sold in the market of the State are produced by the State and some by localized market entities (who will likely be competing to some degree to sell their commodities; many offices, many factories).
    C. All products sold in the market of the State are produced by the market (many offices, many factories) and the State regulates (only) the trade, sale or distribution, therein.

With these three data points, it is possible to compare the social cost (in tokens/credits) of producing something with the valuation put on it by consumers.

> **NOTE:** *When resources and technologies are fully accounted for, then a full socio-technical non-token accounting (system/program) can begin.*

Mises effectively rejected mathematical economics as a method of economic planning. However, in the 1930s and 1940s, Kantorovich and Leontief came up with mathematical methods to solve the problem of planning in natura. Despite the fact that the methods of doing economic calculation have been in the "socialist" literature (in at least Russian, English, and little German); the Austrian school (and others) have dismissed and ignored any deep and humanely- and ecologically-based integrated analysis of this work.

Hayek puts forward his critique to "socialist" economic planning in his article, "The use of knowledge in society" (1945). Hayek's argument has an irreducible subjective element to it:

> *"Most of the objects of social or human action are not 'objective facts' in the special narrow sense in which the term is used in the Sciences and contrasted to 'opinions', and they cannot at all be defined in physical terms. So far as human actions are concerned, things are what they acting people think they are." (Hayek, 1955, pp. 27) This statement by Hayek introduces subjectivism into his argument. Here, the misperception of reality is to [mis-]take one's own, or other's beliefs for reality. Beliefs are not reality. This encoding of subjectivism, taking beliefs and opinions for reality, leads to all sorts of disasters. Beliefs can easily misalign a population from reality, from real-world fulfillment and ecological limitations.*

> *Hayek thought that the difference between the subjective nature of society and objective facts introduced a fundamental dichotomy (i.e., paradox) between the study of nature and of society; since, in dealing with natural phenomena it may be reasonable to suppose that the individual scientist can know all the relevant information, while in the social context this condition cannot possibly be met. (Cockshot et al., 1996)*

To Hayek, the basic problem of economics is that of creating a rational economic order out of the complexity of the real-world, in which fact about knowledge of the circumstances of which humanity must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge, of which all the separate individuals' possess. Here, the economic problem is essentially a problem about brining coherence to the different subjective views that people have in society. In other words, the problem starts off with the assumption that there are a set of subjective views, and economics is a problem of brining the subjective views into some coherent form for societal production. To Hayek, thus, the economic problem is therefore, "How to secure the best use of resources known to any of the members of society, for ends whose relative importance only individuals know." (Hayek, 1945, p.520) The point at issue between Hayek and the proponents of" socialist" economic planning is not, whether planning is done, or not; rather, it is "whether planning is done centrally by one authority for the whole economic system, or is to be divided among many individuals." (Hayek, 1945, pp.520-521) The latter case is nothing other than market competition, which "means decentralized planning by many separate persons". (Hayek, 1945, p. 521; Cockshot et al., 1996)

The next step in Hayek's argument involves distinguishing two different kinds of knowledge:

1. Scientific knowledge (i.e., understood as knowledge of general laws).
2. Unorganized knowledge (i.e., knowledge of the particular circumstances of time and place).

Hayek's argument, commonly known as the "knowledge problem," contends that a centrally planned economy faces insurmountable challenges in efficiently allocating resources; because, the relevant knowledge about supply, demand, and individual preferences is dispersed among countless individuals and cannot be effectively aggregated and processed by a central "authority" (Read: computational system).

The former, Hayek states, may be susceptible to centralization via a "body of suitable chosen experts", but the latter is incomprehensible (Hayek, 1945, p. 521). And certainly, at a time before the Internet, databases, and GPS, the later may be incomprehensible, but in the early 21st century, it is not. Hayek further states that effective economical management requires that, "new dispositions [be] made every day in the light of circumstances not known the day before". (Hayek, 1945, p. 524) In reality, a large part of this uncertainty is just due to the chaotic character of the market. Hence, Hayek brings in the chaotic character of the market to justify the chaotic character of the market, thus introducing circular reasoning. (Cockshot et al., 1996)

A central theme of Hayek is that the market acts as a "telecommunications" system, which might seem a reasonable analogy to someone present when telecommunication systems were just beginning to emerge as a technology on the planet. Hayek provides an example of what he means:

"Assume that somewhere in the world a new opportunity for the use of some raw material, say tin, has arisen, or that one of the sources of supply of tin has been eliminated. It does not matter for our purpose and it is very significant that it does not matter which of these two causes has made tin more scarce. All that the users of tin need to know is that some of the tin they used to consume is now more profitable employed elsewhere, and that in consequence they must economize tin. There is no need for the great majority of them even to know where the more urgent need has arisen, or in favor of what other uses they out to husband the supply." (Hayek, 1945, p.526)

In reality, the market is not an efficient telecommunications system. A telecommunications system is efficient, like every socio-technical system is efficient, when it is based on cooperation, and not, on competition, on transparency, and not, secrecy, and on restoration, and not, punishment. Scientific information theory, and the formal mathematics therein, prove Hayek's argument wrong. (Shannon et al., 1949) Hayek's notion of information remains, definitionally, pre-scientific (and pre-modern-computation). (Cockshot et al., 1996, p.7) What communication takes place in the Market and under conditions of scarcity and coercion are different than what communication takes place under community conditions; within a community-directed, centrally distributed, planning system. Community is centrally distributed because it develops and applies a unified societal standard in conjunction with a global habitat service system forming a semi-distributed, semi-autonomous network of customized local habitats (i.e., local habitat service systems). Community-type communication openly shares of useful for societal benefit.

In the early 21st century, technology and user interaction, allow for systems (Read: teams of contributors and community users) that have a high-level of informational context (i.e., situational awareness, metadata) about users, their demands, and about real-world resources and ecological limits, about the total economic context. Hayek thought that information about persons and their demands was only sufficiently possible through the trade-/market-based "price" signals, given by the metaphorical "body of the market". Hayek writes that the significant thing about the prices system is "the economy of knowledge with which it operates" (Hayek, 1945, pp.526-527), as if, "price" information carries with it intrinsic information about the state of and changes in the real-world and about what humans need and require. In the early 21st century, real-time communication, information processing and storage enables all of the information necessary to solve the economic problem of yearly and multi-yearly mathematically calculating an economic system via a central planning algorithm, without markets. With the necessarily information it is possible to perform the calculations, to plan the production and distribution of goods and services. Kantorovich came up with an effective means by which socialist planners can calculate the most cost effective way of using tools and resources.

> **NOTE:** *In the market-State, war economies are prototypical high-planned, central economies.*

The notion of the "subject" in the market-State is derived from the idea of an extant:

1. Subjective individuated user ("consumer") who has issues and places demands for socio-technical services.
2. Citizen-subject, who is expected to follow the law, and is a contractual [private-]property owner.
3. A legal fiction is a legal [social] construction, contract, a treaty, a special-legal agreement, a corporation "of articles", a business "plan", a trust "of assets", a State "of property policing" or a State "community configuring".

Economic "subjects" in the market-State are legal abstractions, not real people. In some States, the absurdity even reaches the level of having corporations be defined as citizens, like real individual people. A law may be based on a belief, or it may be a necessary social function for the viable replication of the system, the species (considering, viable replication theory). Hayek's economic "subject" is a reification of the market grouping of "subjective ideas", within every individual. Hayek projects his belief that all efficiently and sustainably accessible can only be priced access, through a market (i.e., trade, and not scientific coordination).

The market-State is essentially concretizes the ownership of resource in the form of legal-State enforceable "private-property and public-/State-property" relations among owning individuals and economic sub-classes. The concept of the separated economic "subjects" who do not share a common heritage (planetary-ecological heritage) or objectively coordinated life reality [common-heritage contribution and habitation resource-platforms], otherwise known as, individual "capital" (Read: market "self-ownership", from which there is self-sale and private-property). Under market conditions, each person becomes a legal object with market-State inputs and outputs. The most notable output for the individual is their "salable" labor in return for some exploited wage (exploited, because profit is extraction from the only other one who counts in the moment, the other human being). In the market-State, the citizen can own property, the citizen can sell property, the citizen can sell their physical body-property (culturally limited), and no person can own the physical body of another as property (i.e., no full slaves); but, in the market, all (except criminalized, sometimes) individuals can sell their own physical body property for work in return for money (a business transaction), or other exchange. (Cockshot et al., 1996)

In the market, where trade is universal, the concept of an economic "subject" refers to all individuals in a population being separated from one another by "priced" access to property. In a community-type society, the concept of an economic "subject" refers to each and every individual with accountable human needs living within this common [heritage] planetary ecology. Human needs become issued demands, engineered productions, and then, usage of habitat services (operated by habitat teams), which are fed-back information flows into the unified societal network-city system's production system, itself. Hayek's essential exclusion of science, as a method for studying reality to more greatly inform societal construction, is untenable. The exclusion of science from the study of society is untenable; because, it presumes that human need fulfillment cannot be informed by a scientific approach. Science has to explain the explain the motions and constructions of society. Without science about human fulfillment, planning for technological and service productions becomes uncertain, and price is likely to become paramount. Fundamentally, Hayek's argument, and the argument of subjectivists in general is that the integrating data for understanding and economic fulfillment only comes from the category of subjective (individual specific) information (i.e., no universal, objectively shared context). Hayek's notion of "economically useful" information is pre-scientific. The subjectivist view is that information is subjective; thus, there is no accounting for the common good (objective), and persuasion (and ownership) becomes the method of account. In reality, knowledge in the minds of many can be combined for the common good. Because Hayek's view is irreducibly subjective, it lacks any kind of planning. (Cockshot et al., 1996)

1.4.2 The computer-power problem

> **INSIGHT:** *There is a distinct difference between [social] power embedded in an authoritarian hierarchy and the [technical] computing power of a computational system. This distinction must necessarily be understood for the "economic calculation problem" to be seen for what it truly is.*

'Computational power' refers to the speed that instructions are carried out by a computer. Computing power would include this, but would normally include other aspects of the system as well (i.e., all operations/operational processes), such as memory and bandwidth for i/o, and other hardware aspects of the system. In other words, computing power refers to the operation processing capability of a computing system; including, the types of operations the system can process.

Clearly, having more computational power allows a computing system to do more [work]. Yet, computing power is not [authority-driven] socially hierarchical power (as power over strategy); instead, computing power is more akin to strategy added power. If for any given amount of computing power [a given amount of memory and compute cycles] and a particular task, there is an optimal system for doing that task with that amount of compute power.

If rational behavior is the [most] optimal way of meeting and completing a given task and we think of systems as living on a continuum, then as systems get more computational power they can choose actions that are closer and closer to being the/an optimally rational action.

It is important for us, as a society to come to the realization that we are going to have intelligent systems around us, and that we are going to have to choose what type of environment they facilitate in the creation of: an environment that brings out the best in people or an environment where they compete with, control, dictate to, limit, and reduce people (i.e., perform the role of government more efficiently). Hence, it is important for us to create an infrastructure today that will give us confidence that our well-being and fulfillment will remain strategically preserved and continue to reflect our goals as we continue to advance in our technological development and accompanying computing power.

If engineers that built bridges had the same levels of standards that business does for software then no one would drive on them. In other words, software businesses do not generally utilize provably safe mathematical tools in the design of their software.

In the case of a resource-based economy we are building and iterating the system in a transparent manner, piece by piece. During the design or re-design process we as a community design into (or encode, "write into") the system the properties that we would like the system to have, such as, "this system will prioritize needs that are required to support life and ecological stability over wants that are not required for life support". Note that to express such a statement a specification language is required.

Just as some Austrian economists put forward the "economic calculation problem", there are computer scientists who put forward what is known as "the halting problem". The halting problem states that you can never prove anything about an arbitrary computer program. The halting problem is true, in part. If you were to take a random arbitrary program that someone wrote, then proving properties of it may or may not be easy. Similarly, if you take a highly manipulated and obfuscated monetary-financial market, then calculating out resources, demand, production, and sustainability would not be easy (or even feasible). But, the system described herein is designed (or generated) from its very transparent inception to have "correctness", feedback, and safety properties designed-in.

The properties that we want the system to have need to be built into the system transparently and from its inception, or at least, next iteration. This is necessary if we want an economic decisioning system that does not generate de-generate propensities as behavioral characteristics of the system itself. In other words, the software of the economic decisioning system must be generated at the same time the proof for the system is created, such that the system doesn't produce economic operations that make it hard to identify and discern what is actually occurring in the system and whether the system is going to violate safety properties or develop further ambiguous and potentially dangerous behavioral characteristics.

Humans find parallel programming and calculating at the order of magnitude necessary for the operation of a societal-level economy particularly difficult. Hence, we need computing systems to perform these calculations for us. And, they must be designed so that they will safely serve as an economic infrastructure that we can trust, that we can iteratively vet, and that facilitate in the creation of habitat service systems that have the safety and fulfillment properties we want. And, from there, we can create more and more powerful and trusted systems through a process of iterative self-improvement, but controlled by the properties of safe proofing. Fundamentally, we want our decisioning system to reflect our highest direction and values, which in the case of a community are reflective of human well-being and ecological preservation.

We want systems that will facilitate our adaptive evolution into our higher potential selves - systems that help us to become that which we want at our deepest level. So, the challenge is not just the technical challenge of building these systems, but also identifying where we want to go, what is the future of humanity, what is the nature of the human experience, and what is it going to turn into? The human element is an integral part of this.

> **INSIGHT:** *If you can build, maintain, and generate trust with others, you can do anything. And to the extent you don't do that, it doesn't matter what principles you use, you'll have problems.*

1.5 Economic technical unit planning and coordination

The questions central to economics (Read: macroeconomics) are:

1. What is needed as the outputs of an economics system?

2. What is required as the inputs of an economic system?
3. How is/will the economic system produce the outputs from inputs?
4. What configurations of the economic system are possible (or, optimal) to produce the outputs?

The questions central to useful economic products of work are:

1. The direct physical labor inclusive time (in hours/day, days/year, years/life).
2. Materials inclusive in the means of production (Read: production technologies, including power).
3. Materials inclusive in the user's habitat service-objects (Read: user products, including power).
4. Average amount of time to produce a habitat service-object (is a calculated measure).

An economy (macroeconomy) can be divided into several main sectors. In a community-type society, the aggregation of all the sectors is called a habitat service system, and the escorts themselves are called habitat service systems (or, habitat service support systems). At the highest level, a habitat service system can be divided into three main sectors:

1. Life support [habitat] service sector.
2. Technology [habitat] support service sector.
3. Exploratory [habitat] support service sector.

Within any economy, each one of these sectors depends on all the other sectors. If the output of each one of the sectors is added, then it will show the overall output of the economy. Here, it is noticeable that a service (industry, sector, etc.) can be linearly represented as a combination of other services. Services can be categorized, prioritized, aggregated, and disaggregated.

Note here that high-level sectors have sub-sectors. An economy or habitat is divided into sectors (in the market, these are often called industries). Each terminal sector produces one service or product (object) defined previously as a demand (in engineering, these are called requirements). Some demand/requirements are intermediary, that is, in order to produce the final demand/requirement, the sector (itself) has a number of internal demands/requirements [for processes and objects] it must meet.

In terms of access, team access/demand is an intermediary production requirement, in order to meet final user, community and personal access, demands.

Input-output tables consider intermediary outputs and the production of a final output. This is useful to societal material planning because it allows the planning system and its users to observe how resources are distributed and used in the production process of a final user product/service. It allows for viewing and calculating flows of some quantifiable amount, which come into, and go out, of allocation [within service systems].

In this way, a producer can know varieties (categories) and quantities of products (goods), and make the necessary adjustments to improve the production system as a mutually interrelated whole.

In a market economic structure, there is the assumption of competition; whereas, in a habitat/community economic structure, there is the assumption of cooperation. Competition and cooperation represent two differently oriented social [system] value states. In a market-State, input and output may be expressed in monetary units. In a habitat, generally, input and output are expressed in natural (or natural derived) units.

If the production of a sector is consumed internally by the sector itself, it is called a closed model. Here, an economy (or society) is stable (Read: not going to fall apart) when the output is its input.

Each sector is, in part, a production (or, produced) system. With any production system, some of the production is used (consumed) by the production process (or, system) itself. This means that, in general, there is an interrelation within and between sectors (production systems). In other words, production systems have requirements for the production outputs of other productions systems, and maybe even from within their own production system itself. For example, the energy/power sector provides power to an agriculture/cultivation sector to operate its machinery, as well as providing power to some of its own systems. So, an output of power is an input of cultivation to produce an output of cultivation. Similarly, food may be a required input into the cultivation system to make more and/or new food. For instance, cultivated animals require food themselves, and a final item of food might require yeast, which is another food. Another complete example is the architecting sector, which provides buildings to the power sector, as well as providing buildings for producing other buildings and the clothing to be worn by humans (which may be worn within and without buildings). So, the architecting sector provides inputs into the power sector as well as proving inputs into its own sector in order to produce the end outputs needed/demanded by humans. Every sector requires some kind of input in order to produce its output. Through modeling it is possible to visualize and understand how these sectors relate to one another in a dynamic economy. Afterward, once what is is accounted for (e.g., in an input-output table), it is possible to run calculations (computational operations, math) on the data. In computation, logicals (logical data and operations) can be written in full (True or False), or abbreviated (T or F). The results of these calculation should be useful for decisioning in determining the next iteration of the economy.

All of this information about an economy can be conveniently visualized ("captured") inside of a matrix (Read: input-output matrix). In other words, it is possible to use a simple matrix equation (Read: input-output planning) to model, understand, and plan for an economy such as defined herein. Simply, a matrix can encapsulate all input and output information for a given economy and all of its different sectors (as long as units/objects and amounts/quantities can be accounted for). In real world economics, only that which can be measured (in either natural or natural derived units) in the real world can be accounted. For instance, volume, electricity, distance and weight can be accounted for in a real world economic system. In non-real world economics, abstractions also become accounted for; pure conceptions are reified. Money is an example of a non-real world economic unit [of account]. There is no such measurable object or process as money in the real world; there is only peoples' belief in money. Money, as an economic categorization, can even become a sector of an economic system itself (e.g., the financial sector).

Matrix equations can be applied to economics problems (Read: mathematical economics). Matrices applied to [object-ive] economics are quantitative matrices, primarily. Versus, qualitative (statistical) matrices, such as, a probability-impact risk matrix. Leontief input-output analysis is a series of equations in which quantities (of materials) can be counted ("valued") within matrices. A basic input-output matrix consists of columns and rows. Generally, the columns correspond to the inputs of each sector, and the rows correspond to the outputs. The Leontief input-output matrix analysis uses physical quantities as inputs and outputs.

The Leontief method for matrix calculation that does not have to include price (i.e., it is a non-price required method for doing economic calculation planning (i.e., it does economic planning using matrix calculation) using either physical quantity units and/or abstraction units. The Leontief model does not explicitly incorporate prices; instead, it provides insights into the production relationships and resource requirements among different sectors. The focus is on understanding the flows of inputs and outputs between sectors rather than explicitly observing prices. In the Leontief model, the units used to measure the inputs and outputs in each sector are physical quantities (i.e., the physical quantity value form). However, it is possible to replace the physical units with abstract point-type units that either circulate (i.e., money), or do not. The choice of units depends on the specific context and purpose of the economic system. Points can circulate, or they cannot, and there doesn't need to be a point count circulation between users at all. Instead of accounting for private property points, it is possible to account for actual human need and preference (use value form), to account for materials (physical unit form), and account for ecological systems (ecological unit form). If labor comes in the form of exchange, then laborers will acquire points (e.g., money, tokens, etc.) for their working hours and/or training hours. If labor comes in the form of contribution (national community service), then laborers are not paid in any points (e.g., money, tokens, etc.); instead, everyone's working hours are considered equal, and thus, is removed from the access "rights" equation because it is equal for all. Hours are still calculated and tracked, but there is no exchange of points for labor (in this case, contribution, volunteering).

Another kind of matrix required for a complex economic model (really a sub-matrix of the sander input-output matrix) is a production matrix (a column matrix), which accounts for how much (how many assembled units) each sector is producing. This matrix typically appears to the right of the Leontief standard input-output matrix. The two matrices can be multiplied together to create another column matrix to show the amount used (or, consumed). In some sense, it is the amount the economy uses (consumes), itself. There is a certain percentage of the economy that will be used/consumed by itself in order to supply final user demand. The products produced to be consumed for sustained and continued production are called intermediary products (or goods), and whatever is left over is the output to humans of the economy. Intermediary means the production of services to produce the final

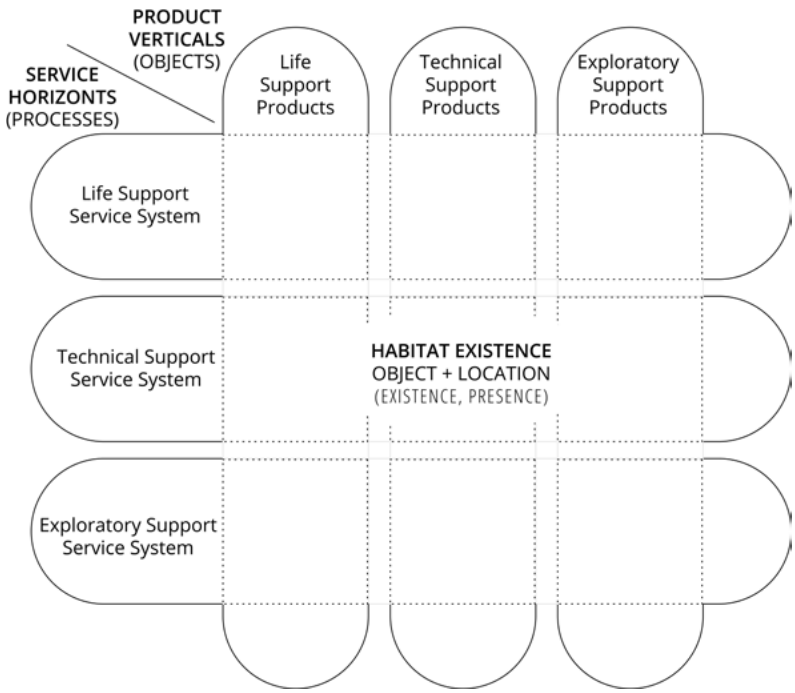

Figure 35. *A simplified view of a matrix/table for habitat service (life, technology, and exploratory) inputs and outputs. Life support outputs are absorbed by other life support outputs, technical support services, and exploratory support services. Each service system is a service with associated resources allocated to products in that service.*

demanded service.

Hence, in this sense, an economic model is a model of production process interrelationships. Different types of society are likely to have different productions and different arrangements of interrelationships for those productions. The sectors chosen [to exist] as part of the economy form its economic input-output network. For humans, it is possible and desirable to select sectors based upon aggregated human need. Thus, each sector becomes an output to fulfill human need and a potential input to another sector to meet human need.

Note here that the production of outputs by sectors for themselves, and for other sectors prior to the production of the final human demanded output, are called intermediary outputs. Intermediary outputs are the outputs of a sector that are required for supporting its own sector, or any other sector, in the fulfillment of final human need. Here, it is reasonable to consider the danger a sector [of the economy] might pose if it is decoupled from human need or the real world.

1.5.1 Habitat sectorized service systems and common economics

A.k.a., The input-output approach for cities, habitat service system planning and operations with input-output modeling.

One important result of a study of interdependent economic systems is the ability to have a better understanding of the system components (e.g., economic sectors), and their interconnectedness with other societal system components. A measure of the interconnectedness of an economic sector(s) is essential to unified societal [economic] planning. Here, resources become interconnected into habitat service production platforms in order to output services and objects demanded for usage by humans for their fulfillment.

A habitat service economy may be formed through the accounting of *resources* and of *access* (as well as *systems* and *participation*):

1. The intermediary habitat service production platforms are composed of resources, and are accessed by InterSystem teams.
2. The final services and objects are composed of resources, and are accessed by community groups (common access) and individuals (personal access).

An economy acts as a service platform; it produces objects (and services). An economy makes things and provides services. In an economic system that is habitat based, a habitat service system provides services to humanity, some of which provide objects to humanity. Herein, the highest orders of service are often called "economic sectors". In a habitat service system, the highest-level economic sectors are: Life Support, Technology Support, and Exploratory support.

At an economic decision level of a habitat, the concept of a "sector" refers to a top-level habitat service support sub-system, a core habitat service platform for humanity. At the material level, where city systems exist (Read: the materialized habitat service system) the term "sectors" is often used to refer to divisible portions of the whole city, and to differentiate various functional locations from the whole city platform.

If an economy is divided into sectors, it is possible to study the inter-sectoral resource flows and transactions between the sectors. In order to create a output from one of the sectors, outputs from the other sectors may (or, may not) be required.

It is possible to plan the operation of a habitat, as it is equally possible to plan the operation of any industrial plant or sector using process evaluation, economic analysis, and linear programming to decidedly optimize material configurations. Fundamentally, the method of optimization applied by various industries, governments, and cities in the early 20th and early 21st century could be applied to the global economy as a whole (i.e., applied to the global habitat service system). Therein, the habitat service subsystems are the processing sectors of the economy. Physical input–output models can be used to aid in the synthesis (design) or operations of cities.

In a habitat service system, each habitat subsystem could be considered an input-output system. Accordingly, it is possible to analyze and plan the pattern of materials and energy flows amongst service systems, and between service systems and the final user. The proposed input-output model can be applied as an accounting and planning tool both to a single city (local habitat service system and to the global city network (global habitat service system). Input–output models can be used to represent supply chain networks in entire economic systems (i.e., in the global habitat service system also known as the cities network or community network of cities). At the city level, an input-output model is necessary to coordinate and control internal and external logistics flows. At both levels, input-output models are used to analyze and plan logistics flows and materialization processes.

A large majority of I–O matrices in the market are measured in terms of monetary units. However, in community, the data are provided in their “natural” (or physical) units.

Integrated city systems allows service systems co-located in the same city to benefit from localized energy, waste, and materials flows that can reduce resource usage and environmental damage. By adopting the input–output framework, the economy is translated into a physical flow of materials and energy for production, consumption, recycling, and waste disposal. The role of habitat symbiosis in integrated cities (and city networks) can be addressed through identifying the objectives (values) and demands of the users.

A habitat economic planning model deals with a supply chain composed of a network of materialization and informatics processes. This network can be fully described if all the interrelated processes as well as input and output flows are identified.

Requirements for a global habitat service system input-output model include, but are not limited to:

1. All habitat service systems are accounted for and modeled as process inputs.
   A. Transport is accounted for as any other habitat service system and is modeled as a primary input that includes distance covered.
   B. Human contribution amount is accounted for.
2. All processes are time referenced.
3. All resources are accounted for and modeled as primary inputs
4. All materialization processes are geo-referenced.
5. All materials are geo-referenced.
6. All land use is accounted and geo-referenced.
7. All land use change is accounted and geo-referenced.

A complete input-output system for a network of integrated city systems will required:

1. A human view of the inputs-outputs.
2. A service view of the inputs-outputs.
3. A resource view of the inputs-outputs.
4. A city view of the inputs-outputs. This view is for the cities network.

1.5.2 Real-world, socio-technical planning

Real world planning requires not one, but many separate natural units as part of its material balancing procedure. Material balances use natural unit, such as meter, meter squared, gram, etc., to plan products. Some forms of planning homogenize the diversity of natural units to a single unit, like money, labor time, or energy credits. The experience of the method of material balances verifies that there is no single natural unit of economic (a resource flow quantity) planning.

For any socio-technically planned economy, there are two primary types of economic requirements/effects that need to be balanced in units and amounts:

1. **1st order materially balanced effect of production** - more requirement of product x; hence, more product y (e.g., steal) is needed to produce product x, because product x output has changed to require more product y (steal) in its design, or there is more demand for product x, and hence, more requirement for product y (steel). Here, capacity refers to product demand being be balanced with (i.e., account for some amount of) the supply or availability of product y (steal).
   A. What demand does the solution meet?
   B. What is the resource composition of the final solution?
2. **2nd order materially balanced effect of production (effects on intermediary goods)** - more coal, electricity, etc., is needed to produce the additional steal. Here, all inputs that go into the steal supply must be balanced with (i.e., account for some amount of) the demand for steal.
   A. What does the solution depend upon?
   B. What are the dependencies' resource composition?

A method or methods may be applied to solve for problems given these two requirements/effects.

Natural units must be accounted for in a real-world, human oriented economic decision system. Once natural units are present in the information set, then the input-output method may be applied to a signaled demand and all possible potential output options may be calculated.

1.5.3 Complexity

Algorithms can be measured in terms of their complexity. The complexity of an algorithm is measured in how the number of instructions used to compute it grows as the size of the problem grows (i.e., as the size of the input data grows). In other words, how long will the problem take to compute as a function of the growth in the size of the input data to the problem.

Complexity defines how long it takes the algorithm complete its task a function of the problem size. There are various complexity classes that grow increasingly harder. Classes include, but are not limited to (O = order):

1. Constant time algorithm - gives the same answer irrespective of the amount of data it is working on.
2. Linear algorithm (linear O N) - will take an amount of time proportional to the amount of data.
3. Log linear class (log linear On log N) - an algorithm takes an amount of time that is proportional to bot the number of data items there is and the logarithm of the number of items (e.g., best methods of sorting).
4. Polynomial algorithms (Polynomial ON2, ON3, etc.) - the time taken is a fixed power of the amount of data (e.g., it might grow as the square or the cube of the number of items).
5. Exponential algorithms (exponential OeN) - the running time grows as eN. Generally, because of their exponential runtime, exponential algorithms are unusable for anything but the smallest economic data sizes.

Indexing and sorting are log n types of problems. The complexity of looking up an item from a number is of order n, or On, with n number of items in it. Problems with log n steps are highly efficient problems for computers to calculate. This is significant, because just the sorting of already available data can turn an intractable (impossible) problem and tune it in to a tractable (possible) problem.

Economic planning requires more than the sorting of lists; it requires matrices of input-output tables. Input output tables can be measured (and computed) in natural units (or, in abstraction units, such as, money, urgency, or priority). Given an [economic] input-output table, it is possible to compute how much of each intermediary product is required to produce a given amount of each of the final [economic sector demand] products to be use (Read: the final output) . Further, it is possible to compute the required contribution ("labor") content of each final output. It is also possible to compute the priority and urgency of content of each final output. And therein, with coordinated scheduling and open source contribution, it is possible to share mutual access to common heritage resources.

1.5.4 Dynamic control and coordination

These dynamic coordination systems have to optimize what is occurring right now, but also navigate the possible current alternatives occurrences and future probable predictable trajectories. The simulation and future planning of a societal economic system must compute and coordinate between multiple contingent options, dynamically, with the purpose of identifying which option is closer to reality, and then that direction/vision may be steered toward. By doing the calculation it is possible to identify options that may not have been obvious or possible in the first place. It is possible to not only consider production in terms of virtual scenarios, but it is possible to visualize society in terms of simulation and standardization. Being able to understand occurrences in a virtual space and then being able to commit to something actual provides additional room for safe maneuvering as a society. A society that optimizes for human flourishing may not know that there are even more optimal ways of flourishing until the calculations and integrations are complete; an adaptive society necessarily has a discovery (exploratory) process going on. Maybe even the things known as flourishing are not fully knowable ahead of time; that is, there is a continuous discovery process (inquiry process) that the society is going through, itself. A society must have some sort of way of generating new possibilities, continuously. In a community-type society, the exploration habitat service system houses several of subsystems primarily dedicated to discovery and possibility generation. A community-based decision system is designed to integrate both the present and the possible futures into one another to navigate a dynamic, real world environment where individuals with an intention of mutual fulfillment interconnect, optimally. It is a serious and complex endeavour to create an open society that can navigate its own possibility space. There is no exchange (trade) between economic agents in a community-type society, like among cooperative species in nature.

In a community-type society, all inputs and outputs for all production processes are known (i.e., are directly knowable). In a market-type economy, globally, inputs and outputs have to be inferred, because competition leads to concealment and a lack of attention to contribution, and thus, lack of data for those who are cooperating. Whereas economic calculation may only be an inferred result, economic under conditions of directly known data makes calculation a precise and possible tool for planning an economy.

2 Product coding (assembly identification)

A.k.a., Object lookup code, object name, object code, product coding for enterprise resource planing, product codes, GTIN, UPC, EAN, ISBN, SKU, product lookup codes (PLU).

A product code is a code (set of numbers and or numbers and letters) in a system that uniquely identifies the product. Product coding is necessary for coherent economic calculation (and economic understanding in general). Product coding is necessary for categorical understanding of products, as well as, the coordination of production, usage, and materials cycling. When coding for products, there is a hierarchical taxonomy that can be populated into a database.

CLARIFICATION: *Habitats are master-planned products too, cyclically.*

Appropriate and accurate categorization is essential for planning a habitat service system, because it enables the mapping (categorized allocation) of products to the three habitat service support systems (life, technology, and exploratory), which therein, allows for appropriate prioritization of products and activities. Accurate categorization also ensures accurate tracking of resources, products, and their usages. Herein, imprecise categorization leads to imprecise models, and then, higher uncertainty that production will meet fulfillment requirements. Being able to categorize objects as similar or different, as well as identify differences, is an essential tool for the planning of an economic system. Herein, product coding is the process of assigning codes to products at different scales. In society, because technology and social development are dynamic, classification accuracy must be continuously assessed, and updated where necessary.

Product codes provide necessary information about products at four principal levels:

1. Categorization of a product type out of all possible product categorization types (e.g., global identification number).
2. Categorization of production run of product (product sub-type; e.g., model number).
3. Identification of each uniquely produced unit [of a product] (e.g., serial number).
4. Identification of location of a unit (e.g., coordinates, location name, etc.).
5. Identification of quantity of units at a location (e.g., count).
6. As well as other product metadata associations (e.g., usage, phase of lifecycle, composition of raw materials, composition of intermediary materials).

In community, the following basic product codes are used for the production and coordination of products:

1. **Global identification number** - an identifier that identifies a specific product or product category.
2. **Model number** - an identifier that identifies the sub-type of a specific product or product category.
3. **Serial number** - an identifier that identifies a unique, individual unit of a product.
4. **Stock keeping units (SKUs)** - an identifier that identifies a specific type or sub-type of product, as well as the quantity of the product, in a specific physical location.

Common coding identifiers for products in the market include the following:

NOTE: *National statistics offices of many States collect, compile, and release "official" statistics. National economic statistics offices, often use unique codes that have been assigned to products and services.*

1. **Global Trade Identifier Number (GTIN)** - is a universal identifier for every possible product, it also generally identifies the manufacturer of the product. A GTIN is typically a 12-14 digit identifier (e.g., generally in the form of a barcode) visible on a product. In other words, it is an identifier that identifies a specific product and the manufacturer of that product. The number (or code) is unique to a product-type and it is universal to its categorization. Simply, a code carries identification information about a product. Internationally, a GTIN is called a different name (for example, UPC code in the US, EAN code in Europe). In the market-State, the code standard to be used depends on where the business is located. Note the usage of the word "trade" in the title of this product coding category.
    A. **Universal Product Codes (UPC) and European Article Number (EAN)** - are product tracking-manufacturing codes that are standardized for use (even in the market, and hence, universal to all market-State operating organizations). In the market, the UPS/EAN is a true universal product identifier. The UPC/EAN code is affixed to a product wherever it is acquired by a user (sold), remaining a constant throughout the product's shelf life. Note here that the EAN (European article number) serves the same purpose as the UPC and has thirteen digits. UPCs are 12 digits, numeric only. There is also Japanese Article Number for all products sold in Japan.
        1. In the market, UPCs must be purchased from business. These "authorities" ensure that

two sets of numbers are not issued to more than one company for a product. Many UPC providers sell them online.
2. The "authority" for creating and maintaining UPC standards for the market is GS1 [gs1.org] (formerly the Uniform Product Code Council).

B. **International Standard Book Number (ISBN)** is a universal tracking-manufacturing code for all text-based materials (e.g., books, magazines, ebooks, and other published objects). The code carries information about the book registrant, title, edition, format, etc. In general, every book version and edition gets its unique ISBN. There are ISBNs with 10 and 13 digits. Those numbers that were registered before the end of December 2006 have 10 digits, while those that are released since 1 January 2007 till now contain 13 digits in length.

2. **Stock keeping units (SKUs)** - are used to account for the amount of a product (specific type of object) in inventory and units of the product that have been acquired by users (e.g, sold). SKUs are alphanumeric code. SKU numbers can be assigned to physical products, as well as intangible products, such as services (i.e., market billable activities), units of repair time, or market warranties. Simplistically, they are product (service) inventory codes. SKUs are used in warehouses and fulfillment centers. In the market, SKUs are unique to different companies. In community, SKUs are universal like the universal product code UPC, but each is tagged with a particular geographic position). Since an SKU is unique to the company, the same product would have different SKUs if sold by different companies, but they would have the same UPC. SKUs are generally on the packaging a product comes in, rather than on the product themselves. SKUs are essential doing calculations on inventory, because it supplies inventory data. For example, a simple example SKU for an 18 quantity stock of red sandals might be: Sand-Red-18. Additionally, it is possible to assign different SKUs to the same product in order to track product batches by quality level, expiry dates (food industry), location (when managing multiple sites), or merchant information (if doing fulfillment as a service). Note that in the market, the term SKU is often used inconsistently, sometimes to mean UPC, the manufacturer part number, as well as the company's part number); these are all improper usages of the conception of an SKU.

A. **Amazon Standard Identification Numbers (ASINs)** - are assigned by Amazon Corporation to products it sells and used to manage and organize all products throughout Amazon. ASINs are 10-digit alphanumeric Amazon-specific SKU codes. On Amazon corporation's website, it is possible to find the ASIN of a product in the product's URL. ASINs are distinct from manufacturer model numbers and from SKU numbers used by other sellers in Amazon's supply chain.

B. **Fulfillment Network Stock Keeping Unit (FNSKU)** - is an Amazon Corporation generated identifier to identify the product that has been sent by the seller to their fulfillment centers. In other words, every unique item that is eligible for fulfillment by amazon (FBA) AND enters an Amazon warehouses should be assigned an FNSKU.

3. **Model numbers (a.k.a., manufacturer model numbers, and sometimes, product numbers, product codes)** - a model number is a code used to identify a group of items made in a production run, such as a particular type of blender, vacuum cleaner, a silicon processor, etc. Simply, serial numbers are issued to individual units within a production run. These may be numeric or alphanumeric. A model number identifies the product sub-type. Note that it is possible to use model numbers as part of the SKUs, but one additional option would be to set them up as [metadata] attributes so that users can use filters. Knowing a model number is essential when garnering services for a product's repair since replacement parts often correspond with a model number.

4. **Serial numbers (SNs)** - is a manufacturers assignment of a unique number to every single individual production of a product type. The serial number will only be for one single object. Serial numbers are unique to each unit. It is a sequential number that is assigned to a single item of a product. In the market, serial numbers are used to track ownership and warranty information of that item. In community, serial numbers are used to track the location, usage, and time elements of a product. Serial numbers are generally numeric only, but may be alphanumeric.

3 Optimal resource allocation calculation planning and analysis

A.k.a., Computational economics, optimal economic allocation plan, optimal allocation calculation, optimal planning, Kantorovich method, mathematical programming, etc.

An optimal economic calculation system uses computer computations to optimize for the fulfillment of all user needs,

1. for interim (means of production) and final goods and services,
2. without money (i.e., without trade/markets),
3. using Leontief-type methods, Kantorovich-type methods, and various statistical analyses,
4. which together informs a plan for economic service production of a city network,
5. within which are three primary service sectors (life, technology, and exploratory).

Without reliance on markets or currency, the a decisioning structure coordinates the production and distribution of goods and services based on societal requirements, rather than market demand. The Leontief input-output model and the Kantorovich method, along with statistical analyses, play pivotal roles in this planning process:

1. **Linear input-output method** (e.g., the Leontief input-output model) - is an economic tool that quantifies interdependencies among different [habitat] sectors in an economy. It provides a systematic representation of interdependencies among different sectors within an economy. By quantifying the relationships between inputs and outputs of various sectors, this model can be utilized to understand the flow of goods and services required among different sectors, including the three primary service sectors: life, technology, and exploratory. It uses matrices to represent input-output relationships between sectors, showing how changes in demand for goods and services in one sector affect other sectors. The mathematical structure involves a system of linear equations that can be solved using matrix algebra to determine the flow of goods and services between sectors.
2. **Linear input-output optimization method** (e.g., Kantorovich method) - is an economic tool used in optimization problems, particularly in linear programming and resource allocation. It enables the efficient allocation of resources to meet production goals and fulfill user needs. The Kantorovich method deals with maximizing or minimizing an objective function, subject to certain constraints, often in the context of resource allocation. The mathematical structure of the optimization model includes techniques such as linear programming, convex analysis, and algorithms to find the optimal allocation of resources as a "plan". This method facilitates in determining the most effective use of resources among the three service sectors (life, technology, and exploratory) to satisfy the diverse demands of the city network's inhabitants.
3. **Sampled statistical analysis method** (a.k.a., pareto efficiency, etc.) - is an economic tool used in analyzing and providing intelligence for decisioning. Statistical analyses encompass a range of methodologies, including data analysis of historical usage patterns, population demand assessments, technological advancements, etc. These analyses are crucial for forecasting demand, identifying resource requirements, and optimizing the allocation of resources across the city's service sectors. Of all the economic statistical analyses, the Pareto efficiency analysis may be one of the most important.
    A. Pareto efficiency relies on statistically comparing different allocations of resources and service/objects, and determining if a change can make at least one person better off without making anyone else worse off. In the market-State, pareto efficiency is a concept more associated with welfare economics and is evaluated based on individual preferences and utility rather than using mathematical equations. However, there are several ways statistical analysis affects decisioning and relates to assessing Pareto efficiency, including but not limited to:
        1. Common-wealth access distribution analysis (access to resources): Statistical analysis can be used to examine commonwealth access distributions within a society or economy. Measures such as the Gini coefficient, Lorenz curve, or income percentiles can provide insights into the degree of inequality within a population. A distribution closer to Pareto efficiency would suggest a more equitable allocation of resources.
        2. Common-wealth functional service analysis (well-being from access to resources): Economists might use statistical methods to estimate personal-, common-, and team-utility from different allocations of resources. This involves assessing needs, preferences,

satisfaction, or well-being through surveys or economic models. Statistical analysis could help compare different distributions and their impact on overall wellness.

3. Efficiency indicators in production: Statistical analysis can be applied to evaluate production efficiency in habitat sectors. Measures like Total Factor Productivity (TFP) or efficiency scores derived from Data Envelopment Analysis (DEA) can indirectly relate to Pareto efficiency by assessing how efficiently resources are used in production processes.

Simplistically speaking, the [socialist] economic calculation method includes, but is not limited to:

1. **Resource allocation data based on leontief model:** Utilize the leontief input-output model to analyze the interdependencies and resource requirements among the life, technology, and exploratory sectors. Determine the input needs of each sector and establish their interlinkages.
2. **Optimization data with kantorovich method:** Employ the kantorovich method to optimize resource allocation, considering constraints, preferences, and production capacities within each sector. This includes balancing resource utilization across sectors to meet the city network's needs efficiently.
3. **Statistical analysis for demand forecasting and distributive justice:** Conduct comprehensive statistical analyses to forecast user needs, considering historical consumption patterns, residency changes, resource changes, environmental changes, technological advancements, contribution changes, and evolving societal preferences.
4. **Iterative planning and adjustment:** Continuously refine the economic plan based on feedback from user needs assessments, technological advancements, and changing requirements.
5. **Quality control and evaluation:** Implement mechanisms for quality control and performance evaluation to ensure the economic plan's effectiveness in meeting user needs and fostering societal well-being.

In economics, an input–output model (I-O or IO model) is a quantitative economic model that represents the interdependencies between different [macro] economic entities and their activities. The input–output (I–O) model views the economic system as a set of interconnected subsystems, which produce outputs (goods) and use resources in the process of production. Input-output models describe and analyse the logistics flows (a.k.a., streams) of spatial and environmental effects associated with production and other economic processes, including demand. Therein, the output from one economic entity becomes the input of another. In fact, economic and operational analysis, planning, and performance can be evaluated through IO tables. IO models are an essential material accounting approach and tool. Input-output analysis is a form of analysis based on the interdependencies between economic entities. Further, input–output (IO) models can be used to study the environmental, social and economics impacts of human activities in an interconnected world. (Rodrigues, 2016) Organizational structures can be represented as a system with interdependent components where the outputs of some components become inputs of another. The input-output model is a essential tool in economic decisioning.

The input-output method is defined in terms of flows [of materials and information]. Essentially, within an input-output table everything is a flow per time (e.g., year) of resource composition (e.g., product Y) into the production process of service (e.g., sector X). Such expressions are sometimes known as flow formalism. Cybernetics introduces the idea of using machines to run the calculations, and machine learning and neural networks are being proposed in the early 21st century as computational frameworks. Under cybernetic planning there are continuous fast calculations and iterations, where different levels of immediate planning and future predictions occur to control operations. Further, demand, usage, and contribution are the three axiomatic points of interaction that an economic (material) system has with its individual community of users.

Fundamentally, input-output (IO) models are tools for economic and operational accounting and planning. (Polenske, 2001). Input-output tables can be used to analyze and plan the structure and flow of an economy. Historically, the input-output modeling approach has been applied to analyze the economic structures of nations and region, in terms of flows between sectors and commercial entities by representing the economy as a system of matrices and linear equations. (Leontief, 1941) Such modeling allows for analyzing and planning the interdependences among all interdependent economic entities. By analysing the interdependencies among entities, it is further possible to evaluate the effect of technological and economic change on an economy, and in the case of community, a habitat.

The widespread use of this method can also be seen by the scale of the scientific literature on the topic. For example, searching for “input–output analysis” in Google Scholar in early 2020 yields over 101,000 documents (this result includes scientific articles, conference papers, books, chapters, and online gray literature). There have also been several individuals awarded nobel prizes for their work in this discipline, including Wassily W. Leontief, Leonid V. Kantorovich, Tjalling Charles Koopmans, and John Richard Nicholas Stone.

Logistics flows can be analyzed from at least the following two perspectives. Firstly, logistics flows can be analyzed from a spatial perspective where entities and processes are described referring to their location. Secondly, logistics flows can be analyzed from an operational perspective that describes all the processes (as a set) in a given geographic area. (Albino et al., 2007:35)

Industry uses the term "supply chain" to refer to a network of production processes, which transform inputs into outputs, and are located in a given area. A "supply chain" may be considered an input-output system wherein a set of tightly interconnected production processes convert materials into final products, which are then delivered to users who demanded them. In other words, a "supply chain" is a network of production processes, including transportation and energy, which transform inputs into outputs, and are located in a given area. (Albino et al., 2002) Note that in the market-State, the term, "supply chain", is an industrial manufacturing term that can have vertical and/or horizontal integration. However, in a community-type society, the supply chain is considered to be fully integrated and there is no competition or sales price between entities involved in the supply chain (as there is in commercial industry).

Input-output activities are essential in order to represent the relationships between production processes and to investigate the effects of possible development scenarios on the economic and environmental performance of the supply chains.

It is relevant to note here that in the market-State there are at least three supply chains for end products:

1. One supply chain that feeds commercial entities: the commercial market, including workplaces, stores, and direct to sale manufacturers and manufacturing for other commercial entities.
2. One supply chain that feeds residential individuals and families: Household supply chain that feeds individuals and families; including retail outlets, stores, restaurants, etc.
3. One supply chain that feeds each government.

Note that there is significantly complexity under market-State conditions in calculating, planning, and otherwise agreeing on inputs, processes, and outputs for society. Here, in general, each individual entity in the supply chain does its own calculation and planning for that which is relevant to its own existence and profit. In a unified societal system, planning is more feasible and significantly likely.

At a basic level, the conceptual framework of an input-output system requires at least four types of data input:

1. Processes: The services, which are processes that transform inputs into demanded outputs (a.k.a., sectors).
2. Inputs: The resource inputs required of each service to be transformed into demanded outputs (a.k.a., resource inputs).
3. Demanded outputs: The known demands of each service (a.k.a., final outputs).
4. By-product outputs: The known non-demands of each service that are a by-product of their processing resources into final outputs (a.k.a., wastes/emissions).

Take note that the usage of natural resources and the generation of wastes and emissions are negative externalities that are not included in the conventional accounting process for economic systems. In the market-State, these flows/streams emanate directly from, or terminate directly to, the natural environment rather than economic sectors within the system. Accounting for such flows plays an critical role in measuring the sustainability of a production process and identifying opportunities for improvement. (Tan et al., 2018:2) In community, these streams/flows are included and are not considered external to the model.

Input-outputs can be geographically referenced with GIS technology and temporally referenced with a schedule. The IO approach can be integrated with GIS technology that spatially references all the inputs and outputs accounted in the model. Spatial complexity, can be modelled through the integration of an I-O approach with a Geographic Information System (GIS), which enables the geographical reference of input-output data, then allowing the organization and processing of information both geographically and logically. (Malczewski, 2004) Inputs and outputs must be spatially (Read: geographically) referenced.

Albino et al., (2007) provide an input-output model of a local supply chain supported by GIS technology. Therein, transportation is modeled as a primary input for logistical services required by each production process to convey its output to its final destination. Therein, the transportation system includes all the tracks covered by transportation means to deliver products.

Scalability and general systems applicability are two useful features of input–output analysis. While the original idea of input–output analysis was for analyzing and planning economic systems, it has been extended to other applications, such as ecosystem food chain analysis, human organizational system analysis, and industrial plant analysis and planning. As a fundamental means of understanding systems dynamics, input–output analysis has proven its versatility not only through its application to the field of economics, but also through its application to various fields of sciences. (Tan, 2018:7)

3.1 Computational economics in historical context

A.k.a., Early work on the economic calculation problem.

Input-output tables and calculations are common in the sciences, and although input-output techniques have been perfected for many decades, in the early 21st century, they are not being used toward any sort of cooperative, global economic plan.

In the 1930s Wassily Leontief formalized an analytical technique to quantify the impact that changes on demand for products had on an economic system. This model was not originally from Leontief, there is earlier evidence of it from Quesnay's "Tableau Économique". In the early 21st century, Wassily Leontief is the primary persona associated with the development of the general model of economic balance, and the use of the input-output analysis in economic planning. Input-output tables are a charting tool that allow for analysing the relation that exists between the inputs and the outputs that a certain economic sector needs for its production. These outputs may become the final product for human demand, or they may become the inputs to another economic sector, wherein they are used by that sector to produce its own outputs. This way different sectors can be connected to the final human demand of a certain solution (or, product). Leontief demonstrated how to combine facts about the world and formula for inter-sector input-output analysis. He realized, the production process is a "circular flow" of requirements

According to Wassily Leontief, "input-output analysis is a practical extension of the classical theory of general interdependence which views the whole economy of a region, a country and even of the entire world as a single system and sets out to describe and to interpret its operation in terms of directly observable basic structural relationships." (Leontief, 1987:860; Heinz, et al., 2020)

The first systematic presentation of computational economics was that of input-output planning as described by Leontif in 1941. Leontif used a matrix representation for the economy, using an input-output table. The input-output model forms a standard matrix representation of the data (i.e., a matrix representation of the economy). Input-output planning is the core of computational economics. Leontief was an economist who wrote a paper in 1941 where he described a way to analyze an economy through a series of equations. Wassily Leontief won a Nobel prize in economics in 1973 for his work on input-output planning and analysis. Through the work of Leontief and others it is known that the production process is a "circular flow" of requirements and resource compositions. It is correct to say that input-output models may be used to model the entire economic production system of a society, which is essential in the construction of a habitat service system for the global population.

Here, there is the problem of quantity for which a structure of the levels of operation of processes of production is needed in order to guarantee the reproduction of the means of production used up in the course of production and the satisfaction of some 'final demand', that is, the needs and preferences of the different access types. Here, there are resources, that may have mutually decided allocations.

Early national socialist economic planners ignored input-output planning as too consumer oriented (in place of reproductive material balance planning), because it accounted for user need, which robbed the human planners of their discretionary power to manipulate the figures. Paradoxically, the pursuit of consistency and equilibrium enabled by input-output tables was not what practicing socialist planners wanted; instead, their top priority was to maximize their discretionary power. Indeed, fear of the abolition of the administrative system of intermediate goods and supplies is at the core of the opposition to input-output tables. Hence, many of the early economic planning systems used material tables (and not, complete input-output tables). Where input-output tables were used, they were highly linear, which is problematic in two respects:

1. There is an assumption that labor (work) requirements will scale linearly with production demands. This assumption is false as more advanced technologies allows for ephemeralization (Read: doing more work with less effort and/or resource input).
2. There is the assumption that raw materials are used to make a product, and after the product's use, it is disposed of, and not, reused or recycled. This assumption is false because some products can be reused and most materials can be recycled.

The moment the demand for intermediate goods is derived from final demand, in an activity model, the reason for the entire administrative and bureaucratic supply system, to even exist, comes into question. Hence, traditional planners used a regulated variable, but it was a variable that is pathological. The planners regulated their own levels of discretion, and did not actually regulate the economy. In other words, they continued a regulated bureaucracy. The method(s) selected by and for the planners were to aid in bureaucratic power regulation, not actual economic coordination for human life fulfillment. This is why the methodology (method selection) is so important to the success of human fulfillment, and why it must be transparently conveyed in a standard available to everyone in society.

The use of material balance planning primarily by early socialist economic players led to planning targets that had little to no relationship to actual user demand (as in, human need). In places where socialist planning did occur, crazy surpluses were produced (e.g., too many shoes, which were then wasted on fields, hoarding became pervasive, and a black market developed as a secondary life-cycle for products). The market often ends up with products that are useful, but bad in some significant way at being useful.

The core of the Soviet-type planning method:

$P_tQ_t = Y_t + TP_t - S_t - T_t$

- Wherein,
  - P is the retail price level.
  - Q is the quantity of goods and services produced.
  - Y is output.
  - TP represents transfer payments (often viewed as redistributed taxes from previous periods).
  - S are savings.
  - T are taxes.

Notice how, in the Soviet system, price is still present. According to the "market theory of value", price is the sole source of value in a commodity. According to the Marxism "labor theory of value", labor is the sole source of value in a commodity. In other words, the real[-world] expenditure that a society undertakes is the expenditure of its people's time. The flow of this labor-time "value" generated by an economy (of people doing labor and consumption) can be thrown off by the inflation of deflation of the unit of value, money (if there is money used in the society).

The "labor theory of value" is capable of being expressed conceptually and mathematically:

Price (of a commodity) = payments of constant (Capital, Labor, and Profits)

1. 'Capital' is machinery and raw materials.
2. 'Labor' is living humans doing work.
3. 'Profits' is more money.

The Soviet-type planning method only eliminates profit, not price. The Soviet-type planning method uses material balance planning primarily to balance price, in order that planner maintain control. In the Soviet-type planning method, bureaucrats and employed planners in the government (Read: labor-State) decide how to balance the economic equation by adjusting the price level on both sides, which impacts priced demand directly. In a Soviet planned economy, price levels can be adjusted directly; they are immediately controllable by those with the authority. Alternatively, in the early 21st century, the financial commodity planning method uses a centralized bank to decide growth ("interest") rates, which impacts the demand for money, which impacts price indirectly. Under financial commodity planning conditions, the authority takes decisions that impact financial institutions, which impact a competitive environment, which impact price, which impact demand. One system uses authority and competition to impact demand, and the other system simply uses authority to do so. To authority, power is the ultimate commodity.

It is not correct to regard material balances and input-out planning as a specific to any type of society (community, capitalist, communist, etc.). All complex socio-technical economies use material balances and input-output planning to some degree. The differences in societies economies typically come in how, and to what end, they are applied.

Since the earlier socialist planners, humanity now has the following additional capabilities that make economic calculation feasible for the global population:

1. Internet allows real-time cybernetic planning. Distributed computation and network block chains can solve the problems of dispersed computation.
2. A unified information systems standard allows for socio-technical agreement (i.e., understanding).
3. Computers can solve the necessary and complex equations in feasible amounts of time.
4. Integrated habitat service systems contributed to by open source methods, to a common, mutually fulfilling standard. This is a habitat service matrix of tables of contribution, priority, urgency, technology, and production service sectors).
5. In a contribution-based system, there are users, some of whom, are also contributors.
   A. Users.
   B. Contributors.

Under these conditions, priorities in the context of demands and requirements therefrom, become clearly visible (or at least, the data becomes available for its computation if a societal arrangement is there is there to compute it). Mutual user access and contribution access in combination with a technology matrix allow for the dissolution of a price between an owner, a laborer, and a consumer, or some combination thereof. Direct population surveys of needs (workgroups, "assessment"), and demands (whole population).

In this system, the society gets back in productions the same amount of production (via contribution) it performs. Products are calculated via direct feedback from demand, which is usage, to planning.

3.2 The linear economic calculation techniques

Linear economic calculation is a simple stepped technique:

1. Know about what is.
   A. Know about the input-output model and know about input-output matrix mathematics.
      1. Construct the input-output chart/matrix/table.
      2. Populate the table with accurate data.
      3. Use matrix calculation equations to derive [more] useful data.
2. Know about what is demanded (needed).
   A. Know about how to calculate the optimal configuration of resources into an integrated assembly of habitat service sectors that optimally meet human requirements.

B. Populate a plan with accurate data.

3.2.1 Linear mathematical planning

The calculated linear planning and decisioning of an economic (habitat service) system [network] can be determined using multiple different potential planning methods, categorized into two axiomatic categories:

1. **The "points" methods (the "priced" method)** - the neutral idea of having a point system that prices a go/no go decision at a threshold price points, upon which the solution master plan is a go/no go. That go/no go decision takes the neutral form of a token and a decision. That is, the token is a unit of trade account:
   A. Exchangeable for object/service (privatization; ownership trade price). Here, there is a trade of a token for access to an object or service.
   B. Exchangeable for doing work (capitalization; labor salary price). Here, there is a trade of a token for labor producing as part of a means of production.
   C. Not exchangeable point system of units of relevant value and object account, as in, the Kantorovich method where there are units of relative administrative value ("points").
      1. The Kontorovich method relies on linear programming techniques (linear programming input-output analysis), providing planners with a computational tool to determine the most efficient resource allocation and production plans, while accounting for the interdependencies between different sectors, considering the input points [thresholds] required and the output points [thresholds] produced by each sector of the economy.
      2. Leontif method (basic coefficient input-output analysis): Basic input-output analysis (a.k.a., Leontief method) does not explicitly consider prices or optimization of resource allocation, however, it can include price in place of physical quality. Therein, it would focuses on understanding the structure and relationships between sectors in terms of points/prices abstracted from resource flows at a material quantity level. The Leontief model starts with a matrix of input-output coefficients, often referred to as the Leontief matrix. Each element of the matrix represents the amount of inputs required by a sector to produce a unit of output. These coefficients capture the technical relationships between sectors and the resource dependencies within the economy.
2. **The non-points method** - does not use any form or points or price; uses objects as quantities and fulfillment as qualities.
   1. Leontif method: Unlike the Kantorovich method, basic input-output analysis (a.k.a., Leontief method) does not explicitly consider prices or optimization of resource allocation. Instead, it focuses on understanding the structure and relationships between sectors in terms of resource flows at a material quantity level. The Leontief model starts with a matrix of input-output coefficients, often referred to as the Leontief matrix. Each element of the matrix represents the amount of inputs required by a sector to produce a unit of output. These coefficients capture the technical relationships between sectors and the resource dependencies within the economy.
   2. Nemchinov (1962).

Price assignment and point assignment refer to different methods of assessing and assigning values or weights to economic variables. Here's an explanation of each:

1. Price assignment: Price assignment involves the determination of prices for goods, services, or resources in an economy. Prices serve as signals that reflect the relative scarcity, demand, and supply of different goods and resources. In a market-based economy, prices are typically determined through the interaction of supply and demand, and other variables. They emerge as a result of market "forces" and reflect the willingness of consumers to pay, and producers to produce and sell. Prices convey information about the value and scarcity of goods and guide resource allocation decisions in the market. Price assignment enables economic calculation by providing a common unit of measurement (monetary exchange value) that facilitates comparisons and trade-offs between different goods, services, and resources. It allows for the evaluation of costs, revenues, profits, and the efficiency of resource allocation.
2. Point assignment: Point assignment refers to the practice of assigning numerical values or weights to specific attributes or characteristics of goods, services, or resources. It involves quantifying non-monetary factors or dimensions that are relevant to economic analysis but may not have direct market prices. For example, in environmental economics, point assignment may be used to assess the ecological impact of economic activities

by assigning values or scores to factors such as pollution levels, biodiversity loss, or carbon emissions. These assigned values or points help in measuring the overall environmental performance or sustainability of different alternatives. Point assignment allows for the incorporation of non-monetary considerations, externalities, or social factors into economic calculations. It helps decision-makers weigh and compare different dimensions of economic choices beyond solely relying on market prices.

To determine how plans are constructed it is useful to ask the following questions:

1. Are the plans commensurate to human fulfillment as an assembled unit of production in the form of a habitat?
   A. An internal inquiry point system to determine optimized production based on categorical inquiry threshold decisions for aligned execution of a solution. Note, there is no need for a commensurate unit between inquiry processes (e.g., between ecological inquiry and preference inquiry); because, each inquiry terminates in a "go"/"no go" decision for a specified solution.
2. Are plans commensurate to private property acquisition and a stabilized trading environment?
   A. If yes, then, a commensurating unit(s) can be used. That commensurating unit can be based on a token trade account (for priced purchases, as a base unit for private property in the market).

Summarily, price assignment primarily focuses on determining market prices for goods and resources, whereas point assignment involves assigning numerical values or weights to non-monetary factors or attributes that are relevant for economic analysis but do not have direct market prices. Both methods contribute to economic calculation by providing a framework for assessing and comparing different aspects of economic choices.

Economic calculation involves the assessment of various factors, which may include both homogeneous and heterogeneous variables, depending on the specific context and the nature of the analysis. There are techniques to analyze homogeneous and heterogeneous variables as economic phenomena, and use results to inform decisioning, and evaluate outcomes. The specific variables considered depend on the particular economic context and the objectives of the analysis.

Some examples of variables considered in economic calculations include:

1. Physical quantities: These are homogeneous variables that represent the physical quantities of goods or resources involved in production, consumption, or trade.
2. Prices and points are often used as a measure of value and play a crucial role in economic calculations, facilitating comparisons and assessments of actions and conditions.
3. Costs and revenues: Economic calculations involve analyzing and quantifying costs incurred in production, such as labor, fixed and marginal material costs, and overhead expenses, as well as revenues generated from sales or other economic activities.
4. Human needs: Heterogeneous variable capturing human needs for life, technology and exploratory services.
5. User preferences: Heterogeneous variables capturing user preferences.
6. Productivity and efficiency measures: Economic calculations assess productivity measures, such as output per unit of input or labor, and efficiency indicators to evaluate the performance of production processes, firms, or industries.
7. Risk and uncertainty: Economic calculations often incorporate variables related to risk and uncertainty, such as probabilities of events, expected returns, and volatility, to assess the potential gains and losses associated with different options.

3.2.2 The Kantorovich method of economic planning

This section presents input-output planning from the perspective of the individual who popularized the knowledge. Kantorovich, a Soviet economist and Nobelist, composed an explanation of how to systematically solve linear algebra mathematical techniques (a.k.a., linear programming or linear optimisation; matrix equations), which solve for objective economic calculation problems. Linear programming involves optimizing (maximizing or minimizing) a linear objective function subject to a set of linear constraints. Kantorovich showed that it is possible to design an optimized [habitat] production plan without any reference to money. The Kantorovich model focuses on optimal resource allocation across different sectors to minimize costs or achieve specific targets. In the same way as Leontief's method, Kantorovich's approach for an optimized production plan, itself, does not inherently involve money. Instead, the plan focuses on allocating resources efficiently to achieve desired objectives and targets within the given constraints. As Cockshott (2018) points out, the significance of Kantorovich's work was that it showed that is possible to use a mathematical procedure to determine which combination of production techniques will best meet planned targets when the initial conditions include a description, in purely physical terms, of the various production techniques available (called, sectors, sub-sectors, or technologies). The Kantorovich method applies an objective evaluation technique to data by organizing it into input-output tables, which can then have operations performed on them to provide more useful data. Kantorovich systematically shows that in-kind calculation is possible, and that there can be a non-monetary scalar objective function: the degree to which plan targets are met. The result of the method is a decision process shown diagrammatically that reveals the optimal [technological planning] decision.

> **NOTE:** *Cockshott (2018:12-13) identifies three areas where Kantorovich's method can be improved.*

At a basic level, Kantorovich's method to solve economic planning problems requires:

1. A linear algebraic algorithm/program.
2. An input output matrix for an economy.
3. A set of initial resources and production sectors.
4. A set of demands and constraints.
5. Final demand vector: The model also considers the final demand vector, which represents the total amount of goods and services demanded by different sectors and by final consumers (households, government, etc.). This vector reflects the desired level of output for each sector.
6. A vector of plan objectives – what Kantorovich called a planray.

The Kantorovich method and the Haromony Planning require, at least (Cockshott, 2019):

1. A flow matrix or flow I/O table.
2. A corresponding technology (i.e., capital, sector, stock, etc.) matrix, specifying the amount of technology "Y" needed to produce an annual flow of product "P" of output quantity "x".
3. A corresponding resource matrix specifying how much resource each type of technology requires in each of its uses.
4. A target vector of net outputs for the current period.

The Kantorovich method uses the methods of:

1. Matrix algebra: To calculate the total input requirements for a given level of output, the Leontief matrix is multiplied by the final demand vector using matrix algebra techniques. The resulting vector represents the total inputs needed by each sector to satisfy the desired level of output.
2. Multiplier effects: The Leontief model allows for the analysis of multiplier effects. By considering the total input requirements, the model can assess how changes in the level of final demand or production in one sector impact other sectors through the ripple effect of interdependencies. This analysis helps understand the broader implications of changes in economic activity. The Leontief input-output model, through its use of input-output matrices, provides a framework to analyze the interconnectedness between different sectors in an economy. It tracks how changes in one sector's output or demand for goods and services affect other sectors. This interconnectedness leads to the concept of multipliers. There are two primary types of multipliers in the Leontief model:
   A. Production multipliers: These multipliers show how an initial change in final demand for a particular sector's output leads to changes in production levels across various sectors of the economy. For instance, an increase in user demand for automobiles will not only impact the automotive production (sector) but also affect sectors supplying mining (raw materials, such as steel or rubber), thus causing a chain reaction of increased demand throughout the economy.
   B. Income or employment multipliers (points): These multipliers illustrate how changes in production levels affect factors like value, income, and employment/contribution within an economy. An increase in production (value(in a specific sector may lead to increased income, increased employment, and/or increased desire for contribution by workers for working in that sector.

The Kantorovich model focuses on optimal resource allocation across different sectors to minimize losses and maximize benefits, to achieve specific targets:

1. Objective function:

   Consider a cost matrix C representing the costs of allocating resources from one sector to another:

   - Input-Output matrix A:

$$A = \begin{bmatrix} a_{AA} & a_{AM} & a_{AS} \\ a_{MA} & a_{MM} & a_{MS} \\ a_{SA} & a_{SM} & a_{SS} \end{bmatrix}$$

   - Where,
     - a_{ij} represents the amount of input required from sector j to produce one unit of output in sector i.

2. Constraints:

There are constraints related to resource availability, production capacities, and possibly demand requirements.

3. Optimization:

   The objective is to minimize the total cost, represented as:

   $Z = \sum_{i,j} c_{ij}x_{ij}$

   Subject to constraints such as $x_{ij} \geq 0$ (non-negativity constraint) and other specific constraints.

To derive a set of useful numbers (i.e., objectively determined valuations), the following inputs are used:

1. The algorithm.
2. The technology available.
3. The objectives of the plan (demands).
4. The constraints on the plan (constraints)
5. The available stock of material resources.

INSIGHT: *Demand is ultimately an issue of population. If there is no population, there is no demand.*

Given this information, it is possible to then apply either Kantorovich or the harmony method to construct a plan. If you want a multi-year plan you need target vectors of net output for each succeeding year of the plan period. If you want a multi-day plan, then you need target vectors of net output for each succeeding day.

The Kantorivich method incorporate points ("prices") as part of the calculation process. In the context of Kantorivich's writing, the method is designed to complete economic calculations (i.e., address the economic calculation problem) in centrally planned economies, where, the State controls:

1. the factory (habitat),
2. the office (working groups),
3. the price (access).

While the Kantorovich method includes points ("prices"), it should be understood that these points are not market-determined, but are set as part of the planning process based on decision inquiry thresholds. The specific process of determining these points can vary depending on the particular parallel decision inquiry. Common approaches to setting prices within the context of the Kantorovich method include:

1. **Administered prices/points (for the "go"/"no go" solution)** - prices are administratively determined by the planning authorities via pre-decided protocols. The authorities consider factors such as equity, environmental impact, human need fulfillment, social priorities, and policy objectives when setting prices for different goods and resources. These prices are often based on directives, calculations, or negotiations among the relevant stakeholders.
2. **Shadow prices** - are "prices" that are not directly observable or administratively set but are derived as part of the optimization process. The Kantorovich method allows for the calculation of these "shadow prices" based on the optimization models and the underlying economic structure. "Shadow prices" represent the opportunity cost or marginal value of resources in the production process and can guide resource allocation decisions.
3. **Iteratively adjusted prices** - are when prices may be determined through an iterative process. The planners start with initial price estimates, administratively determined, and then iteratively adjust them based on the outcomes of the optimization models. This process involves evaluating the results, assessing resource allocation efficiency, and modifying prices accordingly to improve overall economic performance.
4. **Input-output analysis coefficient prices (input-output coefficient analysis)** - a method that examines the interdependencies between sectors in an economy. It quantifies the flow of inputs and outputs among different sectors and can be used to derive relative prices based on the resource requirements and production linkages.
5. **Prices can be set based on input-output coefficients** - reflecting the relative scarcity and importance of different resources. Input-output coefficient analysis examines the interdependencies between different sectors of an economy by quantifying the flows of inputs and outputs. It uses a matrix of input-output coefficients to represent the resource requirements of each sector.
6. **Cost-based pricing** - involves setting prices based on production costs, including factors such as labor, materials, transportation, office work, and "overhead" expenses. The costs incurred in the production process are calculated, and prices are then determined by adding a margin or markup to cover expenses and provide a desired level of profitability.
7. **Comparative analysis** - involves assessing prices in similar or comparable economies or sectors. Planners may examine pricing practices and structures in other economies to inform the setting of prices within their own planning system. This approach takes into account the context and characteristics of the specific economy under

consideration.

The Kantorovich method provides a framework for incorporating these points ("prices") into the optimization models, allowing planners to make resource allocation decisions that align with the desired economic objectives, encoded into the "price". The economic objectives are encoded into the price. In most "socialist" economic proposals, the price is significantly composed of working hours.

In the context of an economy implementing the Kantorovich method or similar mathematical optimization approaches, it is possible to envision a system that operates without traditional forms of currency, trade, or market exchange. Instead of using conventional prices, an alternative concept, such as "points" (a.k.a., "price", "commensurate units of measurement") can be employed to facilitate resource allocation and decisioning. The use of "points" or a similar term serves as a quantitative representation of value within the optimization models (it can even be localized to a team or sub-system, such as each decision system inquiry). These points can be assigned to different resources, services, products or activities, reflecting their relative importance, scarcity, or contribution to the overall goals of the economy and/or society. The mathematical models, typically based on linear algebra and optimization techniques, calculate the optimal allocation of these points, taking into account production capacities, resource constraints, and desired outcomes. The mathematical models, guided by the objectives and constraints defined by the planning decision working group, determine the optimal distribution of resources, production plans, and activities based on the assigned points. By using science- and user-informed points, instead of traditional market prices, the emphasis is placed on achieving efficiency, minimizing costs, and maximizing the overall well-being of all individuals in society.

3.2.3 Material flow analysis (MFA) econonmic planning:

Material Flow Analysis (MFA) tracks the physical flows of materials and resources within an economy. Material flow analysis is a systemic survey and assessment of the flows and stocks of materials within a system defined in space and time (as 3D objects, each with their own geometric-informational model). Material flow analysis quantifies the inputs and outputs of materials in different sectors and provides insights into resource efficiency and sustainability. MFA does not involve price-based calculations or optimization. It emphasizes understanding the physical resource flows and identifying areas for resource conservation and waste reduction.

3.2.4 Modified Leontief models for economic planning

There are many modified forms of the Leontif model. Cumberland (1966) amended the Leontief input-output model to include pollutants and other such externalities (Read: Cumberland I/O model). Rows and columns were added to the original model to highlight the benefits and dis-benefits associated with any economic activity on a sectoral basis. Isard and Daly developed similar approaches along the Cumberland lines to the extension of environmental issues into the input-output framework. Both models are comprehensive in their approach. Each model shows the interactions both within and between the economic and environmental systems. Robert Ayres and Allen Kneese (1969) commented on a slightly varied approach to the problem of externalities. They introduced a concept known as a materials-balance approach which broached the topic of the fact that there is an imbalance between the resources that are drawn from nature, and the return of such resources back to nature.

3.2.5 Energy input-output analysis for economic planning

The energy input-output analysis calculation method does not use price in its mathematical calculation; instead, it uses energy (as "work" capacity). Energy input-output analysis is an approach that quantifies the energy flows within an economy. It tracks the energy (power) inputs and outputs associated with different sectors and economic activities. The analysis typically involves constructing an energy input-output matrix that represents the energy requirements of each sector. This matrix can be derived from data on energy consumption, energy intensities, and energy conversion factors. Energy input-output analysis focuses on energy flows and their interdependencies, disregarding prices. It aims to understand energy efficiency, identify energy-intensive sectors, and explore opportunities for energy conservation.

3.2.6 Adapted Haber (2015) heuristic action rating method for fundamental system functionality calculation economic planning

In a computational economic system, it is possible to rate actions using the fundamental functional components (characteristics) of the system (fundamental system functionality), which include, but may not be limited to:

> *Note that the ratings are primarily designed to fall in a range between -100 and 100, which is to enable mutual compatibility, and make use of the practical features of root functions (they exhibit a steady increase with a fast ascent at the beginning and a subsequent decrease in intensity*

1. **Urgency calculation** (time-frame calculation) - Urgency means, how close to being complete within a given time frame is the request. The closer the request comes to requiring completion, and also, not being complete, the more urgent the request.

   Haber (2015:18) provides an equation that may be adapted to this composition of an urgency request matrix. The following equation may calculate request urgency is adapted from Haber (2015:18):

   $\sqrt{}((T + O_R) \bmod D_R) \times 100/(\sqrt{}D) \cdot C_R$

   - Wherein,
     - T is the current tick.
     - O_R the calculated deadline offset of the requesting agent R (in ticks).
     - D_R is the system's deadline period (in ticks).
     - C_R is a 1 or 0 memory location. C is a Boolean indicating whether the requester has already had the demand fulfilled during the current deadline period. If the demand is fulfilled, C is set zero and thus the whole rating becomes zero, too. If the requester has not had the demand fulfilled, C is set to one and the rating is used as calculated. The function's first factor is responsible for determining a request's urgency as the value under the root increases linearly with approach of the deadline.

2. **Priority calculation** (significance calculation) - Within the decision system, a recognition inquiry process calculates the priority of a request, issue, or demand based on human need conceptualized as a prioritized (and prioritizable) habitat service structure. In a habitat, there are three sectors: life, exploration, and technology.
   A. Wherein,
      1. The life sector is prioritized over all sectors.
      2. And, some of the exploration sector supports the life sector.
      3. And, some of the life sector supports the exploration sector.
      4. And, the life and the exploration sectors require the support of a technology sector.
      5. And, all sectors require the contribution of humans.

3. **Distance calculation** (resource-service-requester distance) - Distance could mean, number of hops or links or length (e.g., cities, regions, sub-sectors, transport networks, etc.) and/or type qualities of method of moving over the distance. Distance could mean the distance a resource has to travel to complete a requirement, or distance could mean a service-object has to travel to interface with and then complete a user demand.

   Haber (2015:18) calculates a requesters distance with the function:

   $\sqrt{}(W/L) \cdot (100/\text{sqr root } D)$

   - Wherein,
     - W is a given request's waitCounter in ticks.
     - L is the number of links or hops between the current agent (e.g., resource current location) and the requester.
     - $\sqrt{}(w/L)$ is a factor that takes into account the amount of time a certain request has been unfulfilled in relation to the distance to the

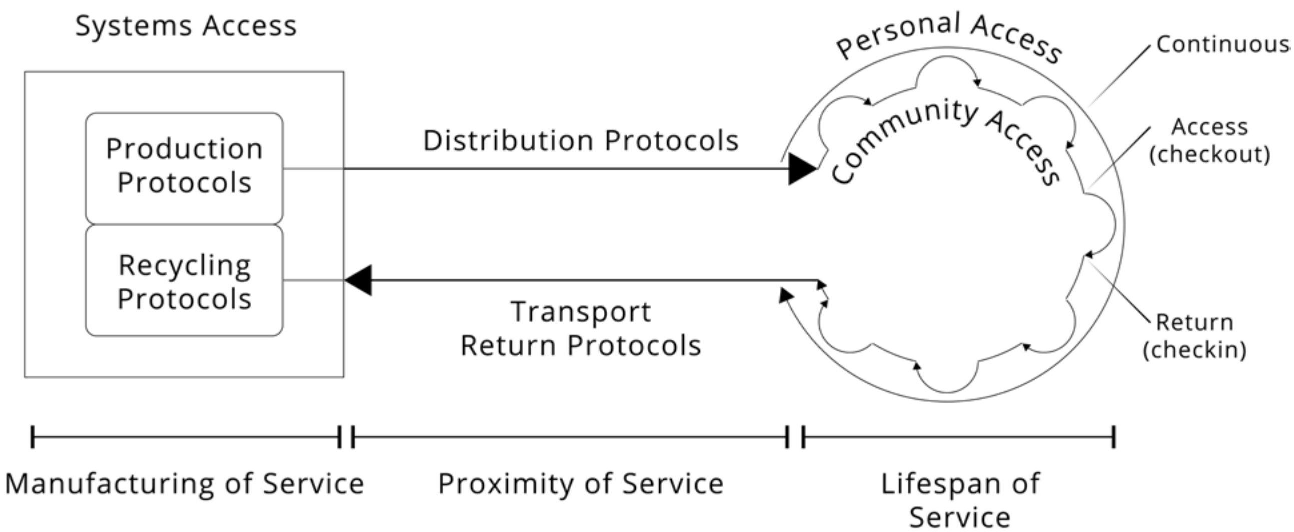

Figure 36. *Model showing visual relationship between access designations and service design.*

requester.
  - (100/sqr root D) is a factor equal to the one in the previous formula, stretching the root function to account for the system's deadline period D (in ticks).

4. **Overall resource request** - total resources requested.

   Haber (2020:19) calculates the overall resources requested with a ratio function:

$$\frac{R(x)}{R} \cdot 100$$

- Wherein,
  - R(x) is the request for given resource or product x.
  - R is the current total resource request registered by the agent.

5. **Resource availability** - Actions may be rated with regard to a resource in an agent's inventory, and with regard to a resource that is not in the agent's inventory, but may be currently occupied by a service or object (source) in its sector [of occupation].

   Haber (2020:19) calculates the overall resource availability via a two step process:

   A. Step one determines the regeneration rating for the sources available to the agent. This regeneration rating is determined though the calculation:

$$\frac{R_S(x,D) - E_S(x,D)}{Q_S(x) + E_S(x,D) - R_S(x,D)} \cdot 100$$

- Wherein,
  - $R_s(x, D)$ is the number of regenerated resources of type x in all reachable sources S within the last D ticks.
  - $E_s(x,D)$ is the number of resources of type x extracted from sources S.
  - Qs(x) is the current available quantity of resources of type x in sources S. This rating is positive if during the last D ticks more resources of type x were regenerated than were extracted. If the opposite is true, the rating is negative.

   B. Step two of the rating process now combines this local availability rating with the distance measurement (Haber, 2015:18). If the availability rating in item 5A (above) returned a positive result, it is adopted as the final resource availability's rating, otherwise it is adjusted by subtracting A:

$$A - \quad (-\sqrt{(W/L)} \cdot R(100/\sqrt{D}) \quad + \quad 100$$

- Wherein,
  - A is the (negative) availability rating from equation 5A, and the entire second part is a translated, inverted and double-scaled version of the root function used before.
  - The result is that the formula calculates the difference between resource availability and requester distance, which will still turn out positive if the request's waitCounter is large enough to overpower the resource scarcity warning discount calculated in equation 5A.

6. **Requester utility (or, receiver utility)** - A rating that assesses for actions concerning the assembly of products.

   Haber (2020:18) calculates the receiver utility by way of another conditional function. If the receiver of the assembled product is the assembling agent itself, the score is determined by:

$$\text{argmax} \quad \left(\frac{\text{size(A)}}{\text{size}(W_A)} \cdot 100 \right)$$

   argmax ((size (A) / size (W_A)) • 100)

- Wherein,
  - Size(A) is the size of the assembled product
  - Size(W_A) is the size of any demand (for a sector's production) containing the assembled part.
  - Determining the argmax of this function effectively returns the best ratio of demand fulfillment that can be achieved with the assembled part.
  - If the receiver of the assembled product is not the assembling agent itself, the distance function of equation 3 is used since in that case the receiver's demand list cannot be accessed.

The economic tables that could be used in this method include, but are not limited to:

1. Technologies list
2. Product list
3. Demands list
4. Resources list
5. Contributions

6. Priority list and urgency list

3.2.7 The harmony method

The harmony algorithm (the harmony function) is of Order NlogN complexity for single year plans. It retains the same complexity of NlogN for multi-year (i.e., multi-cycle plans). The harmony function is a "social utility" function designed to mimic the principle that there is positive, but diminishing utility, as more of a good is produced. It is a function whose value rises as plan fulfillment approaches, but which "rewards" overfulfillment of the plan less than it "punishes" underfulfillment of the plan. Note here that plan targets may be final user and/or intermediary sector demand targets. In a plot of the harmony function, the plan target of N (x axis) hits 0 on the y axis when it hits its target and less than 0 if there is a shortfall. And, it might increase more slowly if the plan is being overfulfilled. In other words, it is worse for society if there is a shortage of something than big surplus of that thing (i.e., than the gain you get for having a big surplus).

Kantorovich approach specifies exact proportionality (square nxn matrix) between all outputs. This may not always be achievable. It may, sometimes, be possible to overfulfill the plan more for some products than

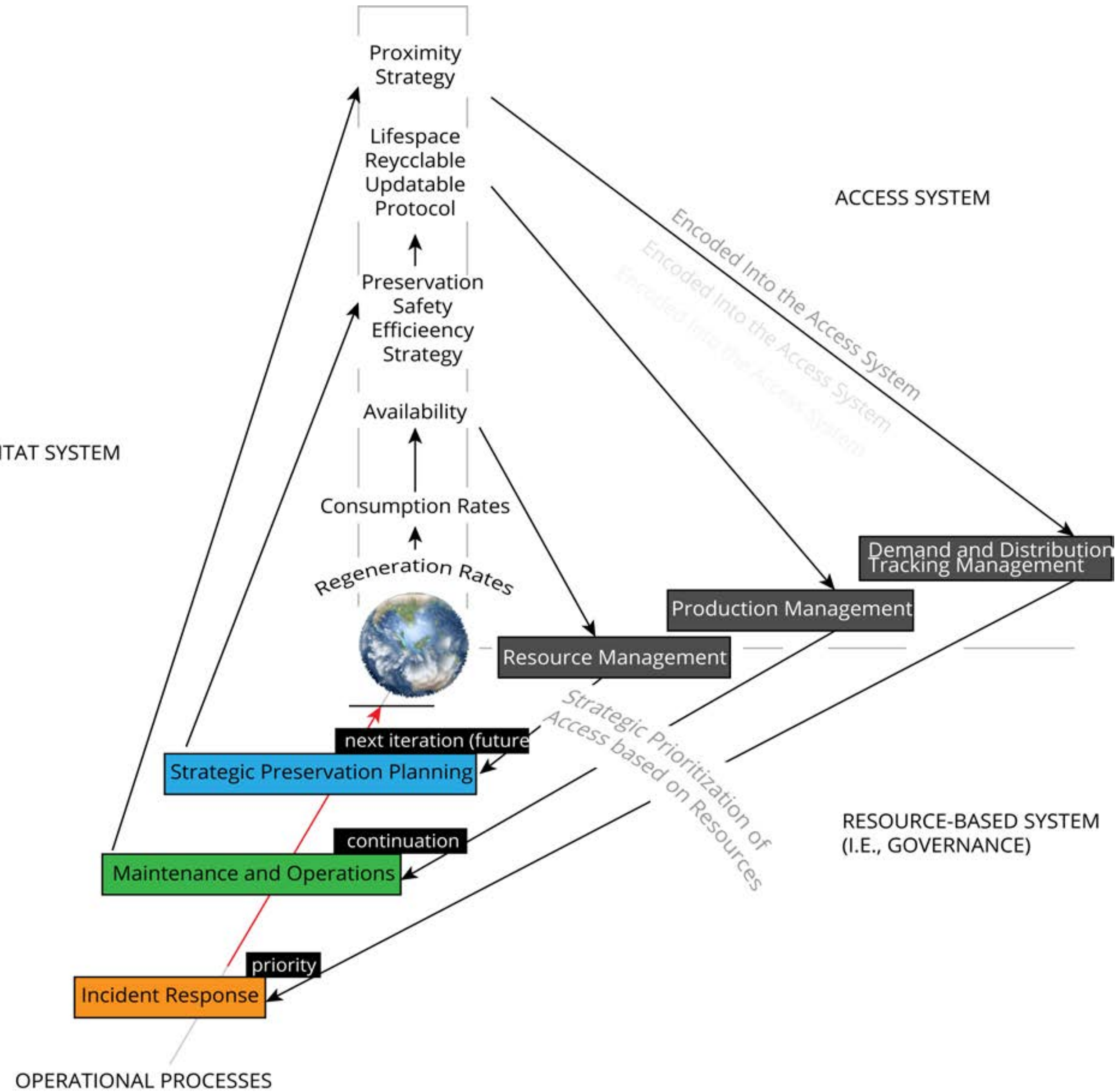

Figure 37. *Accountable dimensions for decisioning within a community-type society. A community-type society resolves decisions by accounting for organization of the system composed of a set of processes that sub-divisible by resource, access, and participation in a real world habitat service system.*

others. And, that may be worth doing. Also, because the harmony function has a continuous first derivative, it allows the use of Newtons method to approximate functions. This allows planning to bring all sectors into approximate alignment with the plan target.

3.2.8 The agent-based modeling method for economic planning

Although the field of Agent-Based Modeling (ABM) was defined by the work of Wooldridge and Jennings (1995), the exact meaning of the term agent is still somewhat controversial. For this project, an intelligent agent can be described as a discrete autonomous entity with its own goals and behaviors and the capability to interact, and adapt and modify its behaviors. In other words, conscious individuals are self-integrating, and goal-directed entities capable of interacting with one another and an environment. Agent-Based Models represent real-world systems using a conscious individual approach, wherein multiples of conscious individuals create a network of effects between the individuals.

In the real-world, the individuals (agents, subjects, etc.), are dependent on the environment for their persistence and fulfillment, which includes an environment of other consciously integrating individuals and common objects (resources).

Hence, economic automation is, in part, a resource allocation problem (a.k.a., object allocation problem). Multi-Agent Resource Allocation is the process of distributing a number of items amongst a number of agents. The objective of a resource allocation procedure is either to find an allocation that is feasible (e.g. to find any allocation of tasks to production units such that all tasks will get completed in time); or to find an allocation that is optimal.' Resources are, generally, indivisible items that may or may not be shared by agents (for example network access as opposed to production tasks), but in some cases may also represent divisible items such as electricity, which can be distributed in fractions. (Chevaleyre et al., 2006)

3.2.9 The Samonthrakis method of economic planning

Samothrakis (2020) details an automated planning system under the tradition of Marx, Leontief, Kantarovich, Beers, and Cockshott as a viable and desirable alternative to current market conditions. In the paper, Samothrakis shows the triviality of planning for up to 50K of industrial goods and 5K final goods in commodity hardware. Samonthrakis shows how it is possible to remove products from market circulation and provision them directly to the population through calculation, cooperation, and globally coordinated planning. Direct economic calculation of products and services is generally called "planning in natura" (Cockshott, 2008), and has direct links to the idea of "universal basic services". One of the primary goals of economic calculation and planning is to remove uncertainty within production and provide a population with access guarantees. More simply, the ultimate goal of an input-output matrix is to plan for demand at the end of a time period. Herein, planning goals are formed using data collected from production units (e.g., factories) and individuals. The goal of the plan is to deliver a set of [real-world] products and services ("goods"). It is important to note here that Samonthrakis' economic calculation plan is only designed to supplement the failures of market and is not designed to abolish it. However, combining it with the rest of the material in this societal standard it is possible to abolish the market entirely.

Samothrakis (2020) introduces the idea of Open Loop In Natura Economic Planning, which adapts the standard input-output with the following:

1. Given that the goal is to provide necessities to sustain humans, set all "external" demand to zero, and introduce a set of profiles combined with the number of citizens attached to each profile.
2. The input-output matrix describes the interactions between:
   A. Consumption profiles,
   B. a set of industrial goods, and
   C. a set of final goods.
3. Profiles are columns that describe the allocation of final goods to each citizen that has been assigned this specific profile.

The real world execution of the open loop in natura economic plan entails two steps:

1. The planner provides information to the production units on their daily targets and requests information on the previous day history, including IO-coefficients (IO-coeffs) in functional form and externalities.
2. The planner requests information on previous days demand and future demand from each individual (or discovers it).

Samothrakis (2020) calls the method/technique open loop in-kind economic planning (OLIN-EP), which builds upon the traditional input-output economic planning framework. Whereas the traditional economic planning timeframe ("tick") was a year, the OLIN-EP timeframe ("tick") is one day (i.e., the plan is re-calculated based on observations and predictions each day/night). Additionally, OLIN-EP does not operate based on abstract notions of aggregate demand; instead, individuals (or close groups) are expected to communicate their demands and projected demands on a timely (e.g., daily basis). Additionally, the productive unites are expected to recalcuate their input-output coefficients (called IO-coeffs - the values of the matrix) and provide them for plan updates on a daily basis in the form of a function. The OLIN-EP operates on a MDP (Puterman, 2014) with the following characteristics (Samothrakis, 2020):

1. Actions $\mathbf{x} \in A$ capture what the production output of each industry should be. Note that due to notation conflicts with input-output literature we use x for individual actions, rather than the most customary *a*.
2. States $s \in S$ capture sufficient statistics of what we want to operate on, as transmitted every morning by production units and citizens. In our case, s is simply a goods inventory.
3. The transition function $T(s\ 0\ |s, a)$ is formally unknown to us, but it is captured partially by the input-output matrix, partially by the semantics we give to the behavior of different outputs of the matrix, and it operates on the inventory and externalities.
4. The reward function denotes how happy the planner is in a specific state and is generally encoded as $R(s, a)$. We define later on a specific reward function that captures how well the plan targets are met and what damage the plan causes to the world.
5. There is a discount factor γ, which attenuates closer versus further rewards.

Samonthrakis (2020) addresses calculation with following equation:

1. $(I - F(\mathbf{x}))\mathbf{x}=d$
2. This equation allows for the stacking of production units and the utilization of different IO-coeffs values as production scales upward. Additionally, it allows for the planning agent to identify for individuals how important it is to hit certain targets in their profile.
3. Therefore, Samonthrakis identifies the F(x) matrix as:

$$F(\mathbf{x}) = \begin{bmatrix} f_{00}(\mathbf{x}_0) & f_{01}(\mathbf{x}_0) & \cdot & \cdot & \cdot & f_{0n}(\mathbf{x}_0) \\ f_{10}(\mathbf{x}_1) & f_{11}(\mathbf{x}_1) & \cdot & \cdot & \cdot & f_{1n}(\mathbf{x}_1) \\ \cdot & \cdot & \cdot & & & \cdot \\ \cdot & \cdot & & \cdot & & \cdot \\ \cdot & \cdot & & & \cdot & \cdot \\ f_{00}(\mathbf{x}_0) & f_{01}(\mathbf{x}_0) & \cdot & \cdot & \cdot & f_{0n}(\mathbf{x}_0) \end{bmatrix}$$

4. To solve this matrix equation, the gradient can be used directly. The mean squared error $MSE((I - F(\mathbf{x}))\mathbf{x}, d)$ has a gradient that is:

   $\nabla MSE((I - F(\mathbf{x}))\mathbf{x}, d) = 1/n\ ((I - F(\mathbf{x}))\mathbf{x} - d)\ (I - F(\mathbf{x}) - F'(\mathbf{x})\mathbf{x})$.

5. Thus, it is possible to solve the equation using:
   A. A nonlinear least squares algorithm.
   B. A non-linear optimization algorithm.
   C. An end-to-end neural network (note: most useful for highly complex IO-coeffs, while optimizing production at the same time).
   D. A linear solver, such as the power series expansion method (Lahiri, 1976), which is the method selected by Samonthrakis (2020):
      1. $(I - A)^{-1} = \Sigma^{\infty}_{i=0} A^i = I + A + A^2 + \ldots$
      2. Then, it is possible to define a recursive form of calculating for x:
         $\mathbf{x}_{(i+1)} = F(\mathbf{x}_{(i)})\mathbf{x}_{(i)} + d,\ \mathbf{x}_{(0)} = d$
      3. This method will find the global maximum as long as convexity is maintained.

Samonthrakis (2020) defines the demand for a final good as a profile set to zero:

1. $d'_i(a_{ij} = 0)$
2. With, i coming from final goods C, while j comes from profile consumption P.
3. Herein, when a good is removed from a profile, then a surplus is generated. That surplus, divided by how much that profile was expected to get, defines the "humanity of the plan" (Simonthrakis, 2020).
4. Formally, the humanity equation HU_p is:

   $HU_{p = \min/(i \in C, j \in P)} \{\ d'_i(a_{i,j} = 0) / (a_{ij} d_j)\ \}$

5. Every profile places externalities on the economy (e.g., carbon output from productions). These externalities are modeled at each point in time as:

   $\rho(e(\mathbf{x}_t)\mathbf{x}_t)$

6. The total externalities for a plan are the sum of all externalities in time:

   E_p

7. Wherein, p is a function that weights the importance of each externality for each good.
8. Hence,

   $\mathcal{E}^t_{p\ =}\ {}^t\Sigma_0\, \rho(e(\mathbf{x}_t)\mathbf{x}_t)$

3.2.10 Input-output models and time

It is relevant to note here that traditional input-output models have no notation of time (i.e., all production takes place within the same temporal unit). In static equilibrium analysis, a time element has nothing to do. Therein, all economic variables refer to the same point in time. The lack of a temporal unit is significantly problematic for real-world planning (where there is a dynamic and not static environment), but remains suitable for high-level strategic planning (e.g., most States publish input-output tables using monetary prices without a time dimension). However, all real-world production and usage has a time dimension. In the case of production, this is expressed in various forms like gestation times (Read: animal gestation times and the time between when a project starts and when production starts), production times, resource depletion times, usage before re-cycling or maintenance times, etc.

Multiple input-output models that include a time element have been developed, for which Aulin-Ahmavaara (2000) provides an overview. However, these time accountable input-output models (for the most part) are not designed with state-based functional planning in mind. Hence, Samonthrakis (2020) introduces a transition function *T(s 0 |s, a)* and a notion of state *s*.

3.2.11 The input-output model

A.k.a., The input-output method, the Leontif method, the input-output table method, the input-output graph method.

The source of modern mechanisms for planning (in this context) is what is termed the input-output model, which is detailed by Leontief (1986). The Leontief model is a model for the economics of a whole country or region. In the model there are *n* industries (economic sectors) producing *n* different products (service-objects) such that the input equals the output or, in other words, consumption equals production.

The input-output matrix focuses on the interdependencies between different sectors within an economy using input-output analysis. It uses matrices to represent the relationships between sectors. Consider a simplified example with three economic (x) sectors: Agriculture (A), Manufacturing (M), and Services (S).

- Output vector X:

$$X = \begin{bmatrix} x_A \\ x_M \\ x_S \end{bmatrix}$$

- Input-Output matrix A:

$$A = \begin{bmatrix} a_{AA} & a_{AM} & a_{AS} \\ a_{MA} & a_{MM} & a_{MS} \\ a_{SA} & a_{SM} & a_{SS} \end{bmatrix}$$

- Where,
  - a_{ij} represents the amount of input required from sector j to produce one unit of output in sector i.

The Leontief model presents a mathematical relationship, in particular the model's fundamental equation is:

$$X = AX + Y$$

- where,
  - X is the output vector.
  - A is the input-output matrix.
  - Y is the final demand vector representing external demand.

The solution to X is obtained using the equation:

$X = (I-A)^{-1}Y$, where I is the identity matrix.

Input-output modeling is an economic calculation technique. In its simplest form, input-output modeling can be graphed on a table to show the relationship between a set of needs and resources (axiomatic inputs) for a set of things to be produced (axiomatic outputs for services and objects). The type of input-output table shown below is often called a technology matrix, and labeled something like, "Technology Matrix M":

Service-Object		A	B	C	...
Need	A	M_{11}	M_{12}	M_{13}	...
	B	M_{21}	M_{22}	M_{23}	...
	C	M_{31}	M_{32}	M_{33}	...
	...	...	...	...	$M_{...}$

- where,

Humans	Humans have *needs (input)* for *service-objects (output)*.
Items A, B, ... are interrelated	In a habitat service system these may be called economic sectors. These are the service sectors that transform resources into needed service-objects.
A	A need-product, for example, electricity.
B	A need-product, for example, water.
C	A need-product, for example, plant cultivation.
$M_{...}$	Coefficient of relationship between input and output.
Needs	Require identification of (i.e., of the need) and resources. Humans have "needs" as an input category.
Service-objects	Require design and resource compositions. Humans have "service-objects" as an output category.

Herein, Leontief distinguishes two models, which are really one model (the open model) with the closed model being a sub-element thereof:

1. **Open model** (a.k.a., open Leontief model, open input-output model)**:** some production consumed internally by industries, rest consumed by external bodies.
   A. Problem: Find *production level* if external demand is given.
2. **Closed model** (a.k.a., closed Leontief model, closed input-output model)**:** entire production consumed by sectors (industries).

A. Problem: Find *value* (e.g., price, prioritization, urgency, sustainability, etc.) of each product.

It is important here to distinguish between (at least) lists and tables, though both, are in fact, matrices. A table is just a n•m or n•n, whereas a column matrix is a n•1 matrix.

This is a **list** (n•1 - row or column; this example has rows, each with a unique label):

$$\begin{array}{cl} \begin{bmatrix} \# \\ \# \\ \# \end{bmatrix} & \begin{array}{l} \text{Label 1} \\ \text{Label 2} \\ \text{Label 3} \end{array} \end{array}$$

This is a **table** (n•m or n•n; rows and columns with unique labels; A1, B2, A2, ...):

$$\begin{array}{cc} & \begin{array}{cccc} \text{B1} & \text{B2} & \text{B3} & \dots \end{array} \\ \begin{array}{c} \text{A1} \\ \text{A2} \\ \text{A3} \\ \dots \end{array} & \begin{bmatrix} \# & \# & \# & \dots \\ \# & \# & \# & \dots \\ \# & \# & \# & \dots \\ \dots & \dots & \dots & \dots \end{bmatrix} \end{array}$$

- Wherein,
  - B1 = #1 input; A1 = #1 output
  - B2 = #2 input; A2 = #2 output
  - B3 = #3 input; A3 = #3 output

And, **table array (**or just, **array)** is the combination of two or more tables, which has data and values linked and related to one another. An array is a "matrix-like" structure with more than two dimensions.

The input-output model is a technique to study the production structure of an economy considering the mutual interdependence of various sectors using graphic operations and logical algebraic techniques. Thus, the input-output model is:

1. A visual and mathematical tool.
2. A planning and forecasting tool for production (material cycling), given inputs and outputs.
3. A method of analyzing how one economic sector output is used as an input to another economic sector. Here, input implies object (or material) which is demanded (required) by an economic [production] sector for the purpose of production. Here, outputs are products and services to users, some of whom are also producers, as in, contributors). Note that in a market economic type system, there is one additional layer where the products and services do not go directly to the users, but are sold in a market, and then, used by users.

Input-output tables have several functions, including but not limited to:

1. A quantity accounting tool (quantities and their [al] location.
2. A statistical possibility calculation tool (an analysis tool).
3. A scheduling tool (a time planning tool).
4. A visual understanding tool.
5. An input-output analysis model supposes that an economy consists of sectors (e.g., habitat service systems, industries, etc.), and some of the output of each sector is distributed among the various sectors. Input-output tables shows the technical interdependence between service systems in a given environment.

An input-output model (a.k.a., Leontief model) is an economic (resource-requirement-production-demand) model that relates:

1. The production of services and objects using resources.
2. To how they (services and objects) are produced.
3. To user demand/requirement.

Leontief's input-output analysis (Read: the economic input-output calculation method) describes and explains the level of output of each sector of a given economy in terms of its relationships to the corresponding levels of activities in all the other sectors.

Leontief uses a simple two way model that assumes agriculture and manufacturing as two sectors that are interdependent on each other for inputs, as well as a final demand and labour (service) costs. Leontief then expresses this model using value terms (by multiplying prices of factors and services). Subsequently, he then adds an extra row and column for pollution abatement costs. The final demand of the “pollution” is not, according to Leontief, a demand in itself, but a “tolerance limit” to what level of pollution can be borne by the final consumer.

Input-output models use quantitative matrices are concerned with technological problems (technical decisioning), whereas qualitative matrices are concerned more with social decisioning. A quantitative matrix is part of an empirical investigation [into how to best arrange and optimize an economy]. Both quantitative and qualitative methods can be combined together within a unified decision system. Wherein, demand analysis is usually done with qualitative matrices, and input-output matrices plan how to best produce for a given (set) demand of something.

3.2.11.1 *Calculating access with the Leontief input-output model*

Access can be calculated with just a habitat array (technical array) using the "Leontief" input-output method:

p	=	d	+	(	Z	•	p	)

access	=	demands	+	(	habitat service array	•	access	)

1. Wherein,
   A. Access is the total production for a user population of a habitat service system (i.e., their current and planned/potential usage of a coordinated service system operated by contributors using compositions of resources).
   B. p = total production (total output access).
   C. d = demands (total needs).
   D. Z = habitat array; a matrix composed of multiple habitat service matrices:
      1. Objectives matrix.
      2. Requirements matrix.
      3. Contribution matrix.
      4. Schedule matrix.
      5. Procedures matrix.
      6. User access matrix.
      7. Resource matrix.
      8. Technology matrix.

A decision chart for an economic system may be calculated as a complete economic (social array) access calculation:

access (A) = demand (d) + priority (r) + urgency (u) + (habitat matrix Z • access)

$$A = d + r + u + (Z \cdot A)$$

3.2.12 Input-output tables

A.k.a., Input-output matrix, transaction tables.

Input-output tables allow for the building of statistical models for planning an economy. In terms of building a statistical model of a planned economy, it is possible to start from the structure of an input-output model.

The goal of an input-output matrix may be to plan for demand at the end of a time period. The problem of planning has been formally defined in Lahiri (1976). Per unit of time *t*, a set of demands *d* for certain goods (e.g., products, services) are to be satisfied for individual *i*. The planner's goal is to satisfy the demands of each individual. In machine learning terminology, the planning expression akin to a Markov Decision Process (MDP), with an agent (the planner) receiving information (the state) on the plan and a set of rewards related as to how closely the demand is met.

An I-O table shows the interrelationship between the total products and total inputs among different economic sectors.

A single input-output table records the amount of some unit of balanced account that moves through different habitat service systems (economic sectors), and forms of access, in an economy (where resources are transformed by into useful environments and objects, and then once again become resources). Effectively, this technique can be used to do a life-cycle assessment on all the services and objects produced, or probable to be produced, by an economy.

Individual columns in the IO matrix (Read: input-output planning matrix tool) represent how much of some thing (Read: material or product) it takes to produce a single unit of output. The columns in the coefficient matrix conceptually ask the question, How many units of each input (good) are required to produce a single output (good) of the type portrayed in this column? The dot product (a.k.a., scalar product; linear algebraic operation of the sum of the products of corresponding entries) of each row, along with the technical coefficients, represents usage ("consumption") of a specific good/product.

3.2.13 Input-output planning

A.k.a., Input-output table analysis and planning, the input-output planning method, the input-output table method, economic production plan.

When planning using input-output tables, the planners first identify the final demand, and then determine the target of total input required to meet that demand (i.e., the order is reversed to material balance planning). Here, the production is determined by what the user needs (i.e., by the output target), instead of need being residual to what is produced (as in material balance planning). Of significant note, second order instances of changes in production to intermediary products require the input-output method.

A unified societal planning system has the information available (or, procedures to discover the information) to determine the total economic activity of material products and services and optimize user fulfillment.

Input-output tables can be composed in terms of physical natural units, as well as monetary, merit, priority, or labor-time, etc. The selected units concern the particulars of the situation being planned for.

In input-output planning, the plan itself is composed of tables, and an algorithm is selected and run that solves for the optimal flow (out of all potential flows) of resources (materials, etc.) to meet user demand, given that which is available. A unified society is likely to have a unified plan.

In a community-type society, demand is set by the users. In the market-State, demand is set the policymakers, capitalists, administrators, and bureaucrats. In a habitat service system, versus a market-economic system, there is more cooperation between that which is known as demand (i.e., needs, and preferences for service) and supply (i.e., contribution to that which is available under habitat service priority decisioning conditions). Under community-type societal conditions, humans supply demands as: 1) articulated in the form of issues, collected by surveys and issue interfaces, and 2) in the form of contribution to the development and operation of the habitat service system as a part of the InterSystem Team; essentially, forming a reciprocal open source society (versus, a market-State society, for example). It is under the conditions of community that price becomes unnecessary. It is under the conditions of community that authority becomes unnecessary.

Once a priority matrix for habitat operations is published by a decision system, then the computational economic model can simply read the priority values from that matrix. And, combine those priority values with natural[ly observable] units (or their derivatives). An alternative to a human habitat priority matrix and the usage of natural units is, to use "price".

3.2.14 Input-output analysis software

Paul Cockshot has released an open source linear programming software package (Kantorovich, 2020: [drive.google.com]) based on the lp-solve package [sourceforge.net] that uses the Kantrovich method to print (Read: output) objective valuations and the achievable gross output given the available resources. lpsolve is an open source mixed integer linear programming software solver (which is effectively Kantorovich's method). Lp-solve when applied to economic planning has a complexity of Order n3. In other words, in order to calculate a plan as the result of computing the data it will take O n3 (Read: order n3).

LINDO Systems Corporation produces a software package called “LINGO”. LINGO is an optimization models software tool for linear, non-linear, and integer programming. As Cockshot shows, it is possible to use spreadsheets for input-output analysis; however, LINGO has the advantage of using an equation-based interface and also features a suite of solvers for optimization models.

Cockshot has also put together a plancode for a 5-year input-output Harmony-type method plan that uses java and is order nLogn. The java plancode is available via Cockshot's Github repository for the plancode [github.com/wc22m/5yearplan]. (Cockshot, 2019)

3.2.15 Input-output analysis (mathematical economics)

A.k.a., Input-output calculation economics, resource economics, energy economics, resource allocation mathematics etc.

There are two basic "Leontief" input-output models for conducting economic mathematical analysis. In the closed model, all production by sectors is consumed by those sectors. In the open model, there is some form of outside demand for which the production system must account.

1. In **the closed model** there is no external demand, but there is a production vector and a sector matrix:
   A. An *sector resource* **nxn (n•n) Matrix*** **Z** (elementary row operation matrix) of technical coefficients. These technical coefficeints are useful for planning.
   B. A *production* **vector P** of production level (i.e., how much to produce for each product).

   **An nxn (n•n) matrix/table refers to a square matrix/table. The first useful form of habitat sectorization is life. Life is, of course, also composed of technology, which is sectored*

   The closed model can be described by the matrix equation:

   p = Zp

2. The **open "Leontief" input-output analysis method** is a homogenous system of equations that form a model, which comprises of:
   A. A *demand* **vector D** (or d).
   B. An *sector resource* **nxn (n•n) Matrix Z** (elementary row operation matrix) of technical coefficients. These technical coefficeints are useful for planning.
   C. A *production* **vector P** (or p) of production level (i.e., how much to produce for each product).

   The open model can be described by the matrix equation:

   p = Zp + d

3.2.16 Closed input-output analysis model

Consider an economy made up of *n* (some number of) economic production sectors (S) labeled:

$S_1, S_2, \ldots, S_n$

In a certain time period, each sector produces an output of some product (service-object) which is completely utilized by itself or other sectors in a predetermined manner which remains constant during that time period. When simplifying, it is supposed that units are chosen so that each sector produces exactly one unit of its product in the given time period.

Let z_{ij} be the fraction of the total output of sector S_j used by sector S_i. Then each z_{ij} is a non-negative number:

$z_{ij} + z_{2j} + \ldots + z_{nj} = 1$

The *exchange* or *input-output matrix* is an n•n matrix:

$$Z = \begin{bmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ z_{n1} & z_{n2} & \cdots & z_{nn} \end{bmatrix}$$

$Z = [z_{ij}]$

For each sector S_j, let $p_j \geq 0$ denote the quantity of one unit of it output (i.e., the production vector is P):

$$\boxed{P} = \begin{pmatrix} p_1 \\ \vdots \\ p_n \end{pmatrix}$$

Sector S_i has an input of P_i and an output of:

$\sum^{n}_{j=1} z_{ij}p_j$

$$\sum_{j=1}^{n} z_{ij}p_j$$

For an economy to be workable, its sectors should not output more than is input:

$\sum^{n}_{j-1} z_{ij}p_j \leq p_i$

$$\sum_{j=1}^{n} z_{ij}p_j \leq p_i$$

Suppose that P is a production vector that results in an equilibrium:

$p = \sum_i \, p_i \geq \sum_i \, \sum_j \mathbf{z}_{ij}p_j = \sum_j \, \sum_i z_{ij}p_j = \sum_j p_j \sum_i z_{ij} = \sum_j p_j \cdot 1$

If,

$\sum_i \, p_i = \sum_i \, \sum_j z_{ij}p_j$

Then,

$p_i = \sum_j z_{ij}p_j$

Thus, production P is an equilibrium vector if and only if ZP = P.

Note on matrix denotation: The notation form of these equations is seen written in the literature in three ways:

1. **All Caps**

   P = ZP + D   P = ZP

   - A capital variable is a complete matrix (not a list matrix).
   - A lower case variable is a vector.

2. **Caps and Lower case**

   p = Zp + d   p = Zp

3. **Caps and lower cases with lines indicating vectors**

   $\overline{p} = Z\overline{p} + \bar{d}$ $\overline{p} = Z\overline{p}$

   - A capital variable is a complete matrix (not a list matrix).
   - A lower case variable with a straight line over is a vector. A vector is usually denoted by a lower case letter with a bar over it.
     - If the production variable was X, then the production vector variable would be $\bar{x}$, and if it were demand D, then it would be $\bar{d}$:
       $\overline{p} = Z\overline{p} + \bar{d}$
     - In some cases, matrices are designated as a capital case variable with a line over it $\bar{Z}$:
       $\overline{p} = \bar{Z}\overline{p} + \bar{d}$

Notes on matrices operations:

1. Placing a -1 exponent after the symbol for a vector or matrix represents the inverse.
2. Placing a letter "t" exponent or apostrophe (') after the symbol fro a vector or matrix represents the transpose (exchanging rows and columns).
3. A unique matrix, a square matrix with ones on the diagonal and zeros elsewhere, is known as the identity matrix and is a multidimensional "1".
4. An upside-down A (∀) means that the preceding statement applies "for all".
5. A comma (,) may be used delimit indices in the element of a matrix, as in $z_{i,j}$.
6. { } means "is in the set". The symbol ∊ indicates set membership and means "is an element of" so that the statement x∊A means that x is an element of the set A.

3.2.17 Open input-output analysis model

Consider an economy made up of *n* (some number of) economic production sectors (S; S_1, S_2, ... , S_n) and some external source of demand for some of the output of each sector. Interpret z_{ij} as the unit value of the output of sector S_i needed to produce one unit's value of output of sector S_j. Then each z_{ij} is non-negative:

$\sum_i z_{ij} \leq 1$

$$\sum_{i} z_{ij} \leq 1$$

Let p_j be the number of units to be produced by sector S_j.

The production vector is $\overline{p}$ (P or p):

$$\overline{p} = \begin{pmatrix} p_1 \\ \vdots \\ p_n \end{pmatrix}$$

Then, the vector P - ZP = (I - Z)P has components which give the excess production of each sector. And, the user (or, external demand)for output of sector i has a unit value of d_i.

The demand vector is $\bar{d}$ (d or D):

$$\overline{d} = \begin{pmatrix} d_1 \\ \vdots \\ d_n \end{pmatrix}$$

One of the most useful aspects of model is the ability to identify what production is required given some demand. Given a demand vector D, is there a production vector P that meets that demand; that is, (I - A)P = D

3.2.18 The input-output analysis model in greater detail

The relation of dependence of different economic sectors and the product flux (a.k.a., material, resource, etc., flow) between them is expressed by a matrix. The input-output model is highly useful, because of its matrix-based operational flexibility and its absence of complexity to calculate, that make it easy to re-calculate the effects of changes therein. Together, this combination of data categories (i.e., the logic behind it) can be written in matrix equation (X = AX + Y). In an economic system the following listable (placed into rows) equation is satisfied (i.e., the matrix equation for this information is satisfied):

sector: P = matrix Z + D

production of something real: total output = internal consumption (nxn matrix) + external demand

total output = internal demand + final demand

Alternatively,

P = Z + D

Production level (P) = intermediate resource efforts (Z) + final demand (D)

Note that in the literature, there are a variety of different letters, capitalizations, and marks that are used to represent the axiomatic economic concepts, including the accompanying matrices, of production, demand, resource, technology processes, priority, material flow, etc.

1. The **demand vector** is a column of demands:

$$\begin{array}{cc} D = \begin{bmatrix} 4 \\ 12 \\ 16 \end{bmatrix} & \begin{array}{l} \textbf{Item 1}\ (S_1) \\ \textbf{Item 2}\ (S_2) \\ \textbf{Item 3}\ (S_3) \end{array} \end{array}$$

The demand vector list (d):

$$D = \begin{pmatrix} d_1 \\ \vdots \\ d_n \end{pmatrix}$$

- Wherein,
  - D - demands list, is simply a column listing the three demands by users for items 1, 2, and 3. An item could be a service or product.

2. The **nxn sector matrix (technology matrix)** is composed of *n* economic sectors (S; "industries") denoted by:

S1, S2, ..., Sn

The flow (i.e., transfer, transformation, exchange) of products (i.e., resources) can be described by an input-output graph. A table is a type of graph known as a matrix. A base input-output table will always be a square matrix (a.k.a., nxn or n•n). An example matrix composed of [economic] sectors, and their single/standard unit interrelationships, Matrix Z (wherein, Z means the amounts of all the intermediary flows):

S = Sector
Z = Flows

⇩ INPUTS
(consuming sectors; j)

⇩ OUTPUTS *(using sectors; i)*	S_1	S_2	S_3	...	S_n
S_1	Z_{11} - 0.1 # unit	Z_{12} - 0.3 # unit	Z_{13} - 0.4 # unit	...	Z_{1n} - n # unit
S_2	Z_{21} - 0.3 # unit	Z_{22} - 0.1 # unit	Z_{23} - 0.2 # unit	...	Z_{2n} - n # unit
S_3	Z_{31} - 0.2 # unit	Z_{32} - 0.1 # unit	Z_{33} - 0.3 # unit	...	Z_{3n} - n # unit
...	...	...	...	...	...
S_n	Z_{n1} - n # unit	Z_{n2} - n # unit	Z_{n3} - n # unit	...	Z_{nn} - n # unit

The internal production and consumption (intermediary requirements and resources) matrix Z (n•n):

$$Z = \begin{pmatrix} z_{11} & \cdots & z_{1n} \\ \vdots & & \vdots \\ z_{n1} & \cdots & z_{nn} \end{pmatrix}$$

Matrix Z:

$$Z = \begin{bmatrix} Z11 & Z12 & Z13 \\ Z21 & Z22 & Z23 \\ Z31 & Z32 & Z33 \end{bmatrix}$$

- Wherein,
  - Matrix Z - is the name of the sector flow matrix or table (table Z).
  - Z_{ij} - denotes the number of units produced by industry S_i necessary to produce one unit by industry S_j.
  - The numbers (0.1, 0.3, etc.) under each Z cell is the example number of units required to be produced (or, produced) by industry S_i necessary to produce one unit by industry S_j.
    - # = the value itself; the amount to be (future) or being (present) produced.
    - unit = the label of the unit shared by the values. Units can be natural units or abstract units like price.

3. The **production vector** is a column of total production outputs.

The following is a simple three sector economy consisting of three sectored demands: food (x_1), clothing (x_2), and shelter (x_3):

$$P = \begin{bmatrix} p_1 \\ p_2 \\ p_3 \end{bmatrix}$$

The total production output vector (p):

$$\boxed{P} = \begin{bmatrix} p_1 \\ \ldots \\ p_n \end{bmatrix}$$

4. The **matrix equation** becomes available because all data herein is essentially organized by matrices, the above system of linear equations is equivalent to the matrix equation (i.e., in matrix notation or matrix form):

X = AX + B

Note that the equation is often written in the literature using any number of different letters, for example: Ax + D = x; AX + B = X; AX + Y = X, Ax + f = X; or Ax + Y = x; etc.

In this context, the equation is represented as:

P = ZP + D

$$Zp = \begin{bmatrix} Z_{11} & Z_{12} & Z_{13} \\ Z_{21} & Z_{22} & Z_{23} \\ Z_{31} & Z_{32} & Z_{33} \end{bmatrix} \begin{bmatrix} p_1 \\ p_2 \\ p_3 \end{bmatrix}$$

- Wherein,
  - P = production matrix (output vector, column matrix; total output of each sector).
    - P = n • 1 vector of sector outputs.
    - P = p_1, p_2, p_3
  - D = demand matrix (final demand vector, column matrix; total demand output for each sector).
    - D = n • 1 vector of final demands.
  - Z = input-output matrix (square matrix).
    - Z = n • n matrix of technical coefficients.
    - Z = Z_{11}, Z_{12}, Z_{13}...Z_{33}
    - In the literature, [Z] is typically called the Leontief technical coefficient matrix.

Together, the data may then be turned into a series of rows, with each row having a label associated with its production of a real-world service or object (that requires real-world resources and contribution), and is expected to be used by a user who is requesting the service or object:

Production of a real service or object	Total Output	=	Internal consumption	+	External demand
Life (S_1)	p_1	=	$p_1 + p_2 + p_3$...	+	d_1
Technology (S_2)	p_2	=	$p_1 + p_2 + p_3$...	+	d_2
Exploration (S_3)	p_3	=	$p_1 + p_2 + p_3$...	+	d_3

- Wherein,
  - p_1,p_2, p_3 are the total output of S_1, S_2, S_3.

For example, this information can be represented in several ways:

	Input			Final demand
Output	P_1 Steel	P_2 Auto	P_3 Oil	
$P_{1\ (steel)}$	Z_{11}	Z_{12}	Z_{13}	d_1
$P_{2\ (Auto)}$	Z_{21}	Z_{22}	Z_{23}	d_2
P_3 (Oil)	Z_{31}	Z_{32}	Z_{33}	d_3
Primary inputs	L_1	L_2	L_3	

The following is a more complete version of the rows, without the S designations, and with a more complete intermediary (internal amounts) matrix:

Total Production / Final Supply (p)	=	Internal amounts of production and consumption (intermediate uses, Zp)	+	Amounts of production going to final user (final uses, d)
p_1	=	$Z_{11} + Z_{12} + Z_{13} + ... + Z_{1n}$	+	d_1
p_2	=	$Z_{21} + Z_{22} + Z_{23} + ... + Z_{2n}$	+	d_2
p_3	=	$Z_{31} + Z_{32} + Z_{33} + ... + Z_{3n}$	+	d_3
...	=	...	+	...
p_n	=	$Z_{n1} + Z_{n2} + Z_{n3} + ... + Z_{nn}$	+	d_n

- Wherein,
  - p_1 is the total production of sector 1.
    - $p_1 = Z_{11} + Z_{12} + Z_{13} ... Z_{1n} + d_1$
    - In other words, some of the production of sector 1 will go to sector 1: Z_{11}. Some of the production of sector 1 will go to sector 2: Z_{12}. Some of the production of sector 1 will go to sector 3: Z_{13}. This pattern continues until the full number of sectors is reached: X_{1n}. Plus the output that goes to actual user/people demand d (or, Y, D, etc.) for sector 1: d_1
- p_2 is the total production of sector 2.
  - $p_2 = Z_{21} + Z_{22} + Z_{23} ... Z_{2n} + d_2$
  - In other words, some of the production of sector 2 will go to sector 1: Z_{21}. Some of the production of sector 2 will go to sector 2: Z_{22}. Some of the production of sector 2 will go to sector 3: Z_{23}. This pattern continues until the full number of sectors is reached: X_{2n}. Plus the output that goes to actual user/people demand d (or, Y, D, etc.) for sector 2: d_2

The fully expressed coefficient transaction matrix for the equation X:

1. $Z_{11}p_1 + Z_{12}p_2 + Z_{13}p_3 + ... Z_{1n}p_n + d_1 = p_1$
2. $Z_{21}p_1 + Z_{22}p_2 + Z_{23}\ p_3 + ... Z_{2n}p_n + d_2 = p_2$
3. ...
4. $Z_{n1}p_1 + Z_{n2}p_2 + Z_{n3}p_3 + ... Z_{nn}p_n + d_n = p_n$

In actual table/matrix form:

Intermediate uses	+	Final uses	=	Final supply
$Z_{11}p_1 + Z_{12}p_2 + Z_{13}p_3 + ... Z_{1n}p_n$	+	$+ d_1$	=	X_1
$Z_{21}p_1 + Z_{22}p_2 + Z_{23}p_3 + ... Z_{2n}p_n$	+	$+ d_2$	=	X_2
...	+	...	=	...
$Z_{n1}p_1 + Z_{n2}p_2 + Z_{n3}p_3 +... Z_{nn}p_n$	+	$+ d_n$	=	X_n

- Wherein,
  - Z_{ij} = Flow (or, transfer) from sector *i* to sector *j*
    - input of sector i to sector j (intermediate usage)
    - Where, both *i* and *j* are $_1$ through $_n$ (i.e., i,j = $_{1...n}$ OR i,j = 1,2, ..., n
    - Z_{ij} - input of sector i to j, normalized with respect to the total output of sector j.
  - d_i = Final demand for [the products of] sector i.
  - p_i = Total output of sector i.
  - p_j - Total output of sector j.

Then, transaction (transformation or flow) coefficients of the IO matrix (Read: IO coefficients) can be defined:

- Z_{ij} = flow (transaction) coefficients.
- Z_{ij} = Input from sector *i* required to produce one standard unit of the product of sector *j.*

It is then possible to assume the following logical ["balance"] equations:

$$Z_{ij} = Z_{ij}p_j$$

$$Z_{ij} = Z_{ij} \cdot p_j$$

- Wherein,
  - $Z_{ij}p_j$ = the output of sector i (e.g., technology) can either be used as an intermediate input to sector j (e.g., life) or consumed as a final product (e.g., technology).
  - Z_{ij} = the total output of sector i is used either as intermediate demands (i.e., Z_{ij}) or as final demand (d_i)

The transaction coefficients form the expression:

$Z_{ij} = P_{ij} / P_j$

$$Z_{ij} = \frac{P_{ij}}{P_j}$$

- Wherein,
  - Z_{ij} = [Quantity of] Input from sector i required to produce one standard unit of the product of sector j.
  - Z_{ij} / p_j = Out of the total production of sector *i*, some quantity goes to sector *j*.

3.2.19 A simplified hunter-gatherer economic example

A simplified hunter-gatherer economy can be used as an example of mathematical economics. In this simplified example, the whole economy consists of three sectors (of demand/service:

1. Food 4 units demanded/needed
2. Clothing 12 units demanded/needed
3. Shelter 16 units demanded/needed

Each of these three sectored services/demands have to be "made" (or, worked toward) by the population. In order to make any 1 unit of any of the sectors, inputs from the other two sectors are required; hence:

1. **To make 1 unit of food requires:** 0.1 food; 0.3 clothing, and 0.2 shelter.
2. **To make 1 unit of clothing requires:** 0.3 food, 0.1 clothing, and 0.1 shelter.
3. **To make 1 unit of shelter requires:** 0.4 food, 0.2 clothing, and 0.3 shelter.

From this collection of data, it is possible to determine how much in-between (intermediary) stuff should be produced to satisfy the three final demands of food, clothing, and shelter. Two simple matrices can be constructed from the available model and its populated data, a requirements matrix and a demands matrix:

1. **Intermediary requirements matrix** (a.k.a., sector flow matrix, production matrix, technology matrix, ratio matrix, input-output coefficients) - "matrix A" tells the planner (=) how much food, clothing and shelter need to be produced, and it is the matrix notation for the three above requirements:

$$\begin{array}{cc} & \begin{array}{ccc} \textbf{Food} & \textbf{Clothing} & \textbf{Shelter} \end{array} \\ Z = & \begin{bmatrix} 0.1 & 0.3 & 0.4 \\ 0.3 & 0.1 & 0.2 \\ 0.2 & 0.1 & 0.3 \end{bmatrix} \end{array} \begin{array}{l} \textbf{Food} \\ \textbf{Clothing} \\ \textbf{Shelter} \end{array}$$

2. **Demands list** (d) - is a column listing the three demands by users for food, clothing, and shelter, in total:

$$d = \begin{bmatrix} 4 \\ 12 \\ 16 \end{bmatrix} \begin{array}{l} \textbf{Food} \\ \textbf{Clothing} \\ \textbf{Shelter} \end{array}$$

3. **Total outputs list** (X) - is a column listing the total production of each of the three outputs.

$$p = \begin{bmatrix} 4 \\ 12 \\ 16 \end{bmatrix} \begin{array}{l} \textbf{Food} \\ \textbf{Clothing} \\ \textbf{Shelter} \end{array}$$

3.2.20 Economic matrix operation to solve for the total demand

Matrix operations may be performed using this combination of data categories. To solve for the total demand, the following formula may be applied:

$d = p (I_3 + Z)$

demand = total output times (IdentityMatrix plus matrix Z)

- Wherein,
  - d = final demand.
  - Z = intermediary requirements matrix (proportion values or ratios).
  - p = total output to be produced.

3.2.21 Economic matrix operation to solve for the total output

To solve for the total output, the following formula may be applied (i.e., the same formula above may be alternatively written as):

$p = (I_3 - Z)^{-1} d$

total production output = (IdentityMatrix minus matrix Z) inverted, times demand

- Wherein,
  - p is how much in-between stuff should be produced to satisfy the three final demands of food, clothing, and shelter.
  - $(I_3 - Z)$ is computed first.

The economic [Leontif] intput-output analytical operation uses the following formula and the earlier requirements and demands matrix:

1. IdentityMatrix is a matrix with 1s down the diagonal

and 0s everywhere else:
I_3

$$I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} - Z =$$

2. The requirements matrix (for food, clothing, and shelter) is subtracted from the identity matrix (I_3 - Z is called the Leontief matrix):
$I_3 - Z$

$$I_3 - Z = \begin{bmatrix} 0.9 & -0.3 & -0.4 \\ -0.3 & 0.9 & -0.2 \\ -0.2 & -0.1 & 0.7 \end{bmatrix}^{-1} =$$

3. The resulting matrix is inverted:
$(I_3 - Z)^{-1}$

$$(I_3 - Z)^{-1} = \begin{bmatrix} 1.5641 & 0.647 & 1.0769 \\ 0.641 & 1.41 & 0.769 \\ 0.538 & 0.38 & 1.864 \end{bmatrix} \cdot d =$$

4. The resulting matrix is multiplied by the demand matrix:
$(I_3 - Z)^{-1} \cdot d$

$$(I_3 - Z)^{-1} \cdot d = \begin{bmatrix} 31.1795 \\ 31.7949 \\ 36.3077 \end{bmatrix} = p$$

This system of matrices can be solved by the use of the inverse of Z, if Z is regular (i.e., $|Z| \neq 0$). Thus,

$$p = Z^{-1} \cdot d$$

The demand vector 'd' represents how much demand there is, hence, in long-form matrix notation:

$$p_i = Z_{i1}p_1 + Z_{i2}p_2 + \ldots + Z_{in}p_n + d_i$$

In short form matrix notation:

$$p = Zp + d \rightarrow (I - Z)p = d$$

And, in table notation as linear equations (i.e., each row in the table is a linear equation):

- *[Re]Sources = Intermediate Uses + Final Demand*
- For, three and 'n' more products: #1, #2, #3, #n

Sources	=
X_1-S_1+M_1	=
X_2-S_2+M_2	=
X_3-S_3+M_3	=
X_n-S_n+M_n	=

Intermediate uses	+	Final Uses
$Z_{11}X_1 + Z_{21}X_2 + Z_{31}X_3 + \ldots + Z_{1n}X_n$	+	$U_1 + I_1 + Ex_1$
$Z_{21}X_1 + Z_{22}X_2 + Z_{32}X_3 + \ldots + a_{2n}X_n$	+	$U_2 + I_2 + Ex_2$
$Z_{31}X_1 + Z_{23}X_2 + Z_{33}X_3 + \ldots + a_{3n}X_n$	+	$U_3 + I_3 + Ex_3$
$Z_{n1}X_1 + Z_{n2}X_2 + Z_{n3}X_3 + \ldots + a_{nn}X_n$	+	$U_n + I_n + Ex_n$

The letter variables used in the above input-output equations refer to:

- p_i - output of the i^{th} service system (planned target).
- S - change in resource stock.
- M - planned tasks/teams.
- Z_{ij} - requirement for input p_i per unit of output in the j^{th} service system. Technical co-efficients (Z_{ij}) are how much of input p_i is needed to produce one unit of output in the j^{th} service system. Technical co-efficients (Z_{ij}) are typically derived from the previous cycle's planning experience.
- U - User usage.
- I - Storage placement.
- Ex - Planned transport.

3.2.22 Economic matrix operation to solve for the allocation of a sector's output to a specific access type

To solve for the allocation of a sector's output to various access/allocation types (intermediate and final) translates to the following mathematical formulation:

$$p_i = \sum\nolimits^{n}_{j=1} Z_{ij} + d_i$$

		n			
p_i	=	$\sum$	Z_{ij}	+	d_i
		j=1			

Substituting equation ($Z_{ij} = Z_{ij}p_j$) into ($p_i = \sum^{n}_{j=1} Z_{ij} + d_i$) creates the equation:

$$p_i = \sum\nolimits^{n}_{j=1} Z_{ij}p_j + d_i$$

		n			
p_i	=	$\sum$	$Z_{ij}p_j$	+	d_i
		j=1			

Alternatively, input-output analysis can be used to solve for different questions and arrangements of relationship. For instance, the matrix equation (AX + Y = X or Zp + d = p) could be written as a relationship between the production and the input-output to that of demand (or, given production x, it is possible to find demand capacity):

$p - Zp = d$

$d = p - Zp$

- Wherein,
  - $(p - Zp)$ = net production in the economy (i.e., the amount that is produced in total, both to meet demand and to keep production going).
  - p = production vector.
  - d = demand vector.
  - Z = technology matrix Z (flow ratio, coefficient).

It is then possible to follow the following procedure and to set net output equal to demand (i.e., given demand d, it is possible to find the production level X (i.e., it is possible to solve for production X):

1. $p - Zp = d$
2. $Ip - Zp = d$
3. $(I - Z)p = d$
4. $(I - Z)p = d$
5. $(I - Z)^{-1} (I - Z)p = (I - Z)^{-1} \cdot d$
   - Multiply by the inverse (...on both sides of the equation)
   - While multiplication with numbers is communitive, that is not the case with matrix multiplication (hence, both sides of the equation must be multiplied)
6. $p = (I - Z)^{-1} \cdot d$
   - Identity multiplied by x (Ix) is equal = $(I - Z)^{-1} \cdot d$

x has now become isolated on the left side of the equation:

$p = (I - Z)^{-1} \cdot d$

- Wherein,
  - I = the n • n identity matrix (I_3) with the same [matrix] size as Z
  - p - vector of p_i (total output of sector *i*)
  - Z matrix of Z_{ij} (direct input coefficient (= p_{ij}/p_i)
  - p_{ij} - transfer from sector *i* to sector *j (i.e.,* input of sector *i* to sector *j*)
  - d = vector of d_i (the final demand for p_i)

The inverse term of the equation can now be defined:

$L = (I - Z)^{-1}$

- Wherein,
  - L = L is define as the inverse term.

The inverse term equation [$L = (I - Z)^{-1}$] can be substituted into the Leontif inverse multiplied by demand equation [$p = (I - Z)^{-1} \cdot d$] to simplify the whole equation:

$p = Ld$

- Wherein,
  - The A Matrix and L Matrix are calculated.

3.2.23 Economic matrix operation for resource requirement calculation

To solve for how many resources (the exact amount) are [needed] in each sector, the following system of simultaneous equations is presented:

$Zp = d$

- wherein,
  - Z = input-output matrix,
  - p = production matrix, and
  - d = demand matrix.

The system can be reconfigured to solve for p as an unknown (i.e., if the production matrix is unknown) by the use of the inverse of A:

$p = Z^{-1} \cdot d$

In linear algebra, there are explicit formula for the solution of a system of linear equations with as many equations as unknowns, which are valid whenever the system has a unique solution. And, the human users of the habitat service system require a uniquely selectable solution.

3.2.24 Economic matrix operation for energy sector calculation

The equation for [energy] sector *i*:

$E_i = \sum^{n}_{k=1} E_{ik} + E_{iy}$

- Wherein,
  - E_i = total output of [energy] sector *i*
  - E_{ik} = intersectoral transaction from [energy] sector *i* to another sector k (any other sector)
  - E_{iy} = sale of something (energy, natural units, etc.) of type *i* to final demand

3.2.25 Economic matrix operation for resources

If the matrix equation is AX + Y = X (or, applied prior, Zp + d = p). The equation may also be applied to resources:

$R_H Rp + Rd = Rp$

- Wherein,
  - Rd - the users specific demand for resources.
  - R_H - total resources used in habitat operations.
  - Rp - total resources used.

3.2.26 Human contribution calculation

Human contribution is calculated via the following equation:

ϒ=ZY + /

- contribution (ϒ) = technology matrix (Z), times contribution (ϒ), plus the direct contribution input vector (/)
  - Wherein,
    - ϒ (Lambda) - contribution is a vector of labor contents.
    - Z is the technology input output matrix.
    - / is a vector of direct contribution inputs

Note: Using an iterative method of solving, the complexity of this calculation can be on the order of nLogn.

3.2.27 Material balance planning

A.k.a., Material balance analysis and planning, the material balance planning method, material balance equation.

Material balance accounting is a form of economic accounting based on balancing inputs with outputs in terms of natural units (expressed in physical quantities, as opposed to "money"). In other words, material balancing is a method of economic planning where material supplies are accounted for in natural units (as opposed to using monetary accounting) and used to balance the supply of available inputs with targeted outputs. Material balances apply measures of a natural unit, like meter, m^2, m^3, etc. In other words, material balances use natural units, such as meter, meter squared, gram, etc., to plan products. Material balance planning consists of a central planning chart specifying a list of inputs required to produce one unit of output, whereupon a balancing of outputs and inputs occurs, so that there is a balance between supply and demand.

A balance is a method of accounting for something (e.g., product or material). The material balance method simply accounts for:

1. Where things (objects) come from.
2. Where things (objects) go to.
3. The total number of things (objects).
4. The changes to the total number (or amount).

When market-based planning using material balances, planners first set the target of total output x, while the final demand y is determined as residual. The term "balance" in material balance planning is trying to "balance" supply and demand (i.e., to try to get supply to equal (=) demand with demand coming second (i.e., as residual, so that it can be sold into the market).

The general material balance technique simply accounts for where things come or go, and how their total number (or amount) changes.

The following is the generic material balance expression::

In - Out + Generation - Consumption = Accumulation

- Wherein,
  - "In" and "Out" are the inputs and outputs to the system, respectively.

In other words, a material balance plan derives accumulation (or, demand).

A material balance table shows:

1. Quantities of inputs, and total input quantity.
2. Quantities of outputs, and total output quantity.

Example, coal (in physical units, kilograms):

Sources	*with* Quantity	Uses	*with* Quantity
Production center 033A	200	Product A383	600
Production center 033B	900	Product A384	200
Total	1100	Total	80

3.2.28 Network environmental analysis and planning

A.k.a., Material flow analysis and planning, resource flow analysis and planning, material life cycle analysis and planning.

Network environment analysis starts off with the understanding that there are behavioral, structural, and functional effects within a network, because a network is a system. In general, the conception of "observable" means any activity measurable in terms of quantifiable effects on the environment, whether arising from internal or external stimulus. Something which is observed or experienced is an output of something prior, an input. Here, state-space mathematics provides a mathematical framework for computing a networked component's response to inputs:

1. inputs (Z_t) received into state (X_t)
2. create a new state (X_t + 1), and
3. produce associated outputs (Y_t + 1)

Two equations are derived from this initial model:

1. The state transition function

   $Z_t \bullet X_t \rightarrow X_t + 1$

2. The response function

   $Z_t \bullet X_t \rightarrow Y_t + 1$

Network environment analyses are typically done on input-output model data. It is possible to diagram economic and ecological (material and informational) networks for the purpose of analysis. A network analysis of a given economic environment is likely to include (Fath et al., 1999):

- **Pathway analysis** - enumerates number of pathways to travel in a network (enumerates options).

The path analysis is the basis for the three functional analyses.

1. **Flow analysis** - identifies non-dimensional flow intensities along indirect pathways.

   $g_{ij} = f_{ij} / T_j$

2. **Storage analysis** - identifies non-dimensional storage intensities along indirect pathways.

   $c_{ij} = f_{ij} / x_j$

3. **Utility analysis** - identifies non-dimensional utility intensities along indirect pathways.

   $d_{ij} = (f_{ij} - f_{ji}) / T_i$

Each of the functional analyses is derived from a different relationship of the flow-storage data, and is used to determine different properties of the system.

The functional flow and storage values transform a structural input-output model into an operational systems model (Read: an operational economic systems model). The combination of system structure and function underlies system behavior and is sufficient to determine the values of the network properties.

In networks, structure and function are analyzed using mathematical models based on flows and storages.

4 Optimal production design planning and analysis

A.k.a., Optimal production calculation protocol optimal production protocol, product design alignment inquiry, production design protocol, production design computation, production controls, macro-economic resource-based calculation, macroeconomic calculation (macro-economic, macroeconomic); global access calculation, solution design viability inquiry.

The decision system of community uses a formalized production calculation process for all serviced productions, which are a function of optimized design in production, distribution, and recycling. In other words, technical service designs are optimized in their *total design efficiency* by optimizing production, distribution, and recycling. These are micro-calculation constraints placed upon decisioning in the system. It is important to remember that evolution implies constraints - evolution doesn't pick the least efficient path; evolution selects for efficiency (e.g., being able to avoid predators and preserve resources is efficient if you are trying to survive and procreate). Hence, we select for efficiency processes so that we can maximize the work that we can do. Inefficiency just uses up unnecessary resources.

In some sense, the following "strategic design statements" could also be considered to be 'network resilience' design principles (or at scale, "protocols"). And, in order to apply these principles toward the "arrival at" or "construction of" a common decision [space] there must concurrently exist trusted transparency to information about the iterative, digital [model/simulation] construct and material structure of the total habitat community (over time).

In community, we live in an openly navigated and steered environment [for our resilient adaptation toward a higher potential state of expression]. Herein, a resource-based economy may be referred to as a massively decentralized and distributed resiliency network for resource transformation and transport by formalized protocol. It is a resource-based system designed for an adaptive fulfillment orientation using a set of emergently defined variable measures formulated into a conditional statement known as a protocol.

Production must be calculated based on:

1. Demand (quantity and preference).
2. Availability (production and stock).
3. Objectives (flows and controls).

4.1 *Design efficiency and design optimization*

The term design efficiency refers to the *optimized efficiency function* and the resulting *optimized efficiency* *standards* for calculating the feasibility, viability, and ultimately, acceptability (i.e., socially optimal; usability) of design solutions. 'Efficiency standards' are the 'standards' to which a given design must conform -- they assess the feasibility of the design and determine whether its encoded orientation is divergent from our values and ultimate direction. This 'feasibility assessment' is calculated automatically and algorithmically. Everyone can *adapt* as well as *audit* its design, which creates system-wide transparency and encodes an accountability incentive into the system. The system maintains this characteristic due [in part] to its de-centralized form, and the structural design of the protocol itself that makes it open to auditing by its users. This is real [world] technical efficiency. (Joseph, 2013)

Optimization and strategic efficiency processes are encoded via a set of 'protocols' and 'feasibility inquiries' into the total calculating decision system wherein the decision space becomes one of anticipatory design.

Broadly speaking, design efficiency has three general elements:

1. **Labor efficiency** becomes consumed by automation and human labor exists where desired and required.
2. **Material efficiency** refers to how well the population utilizes the raw materials of the Earth; including the materials we can create (i.e., material sciences).
3. **Systems efficiency** controls for weakness in the system.

The macro-calculation is a set of four functional process requirements (a rule structure) that all solutions (acceptable solution designs) must adapt to; each of which relates to a stage of material cycling (design, production, distribution, and recycling):

1. *Optimized* **design efficiency**: All product designs must adapt to optimized design efficiency function (sub-process).
2. *Optimized* **production efficiency**: All product designs must adapt to optimized production efficiency function (sub-process).
3. *Optimized* **distribution efficiency**: All product designs must adapt to optimized production efficiency function (sub-process).
4. *Optimized* **recycling efficiency**: All product designs must adapt to optimized production efficiency function (sub-process).

In other words, all service-objects (products, services, etc.) must be well designed, and meet efficiency standards. These material cycling functional process requirements (rules) can be composed into a functional protocol (or macro-calculation). There are two primary parts to the macro-calculation: the production function and the design efficiency function). The production function

4.2 Design calculation

A.k.a., The material function, the production function, economic optimization, the global production and distribution protocol.

The design calculation is a linear process involving decisional aspects of material production and material cycling, from design, to production, to distribution, and recycling. The calculation may be otherwise be described as a supra-function (supra-process or protocol). This function uses dynamic feedback from an earth-wide accounting system about all relevant resources that pertain to all production and general materials cycling. In a sense, this is a sustainability protocol for material cycling (i.e., it allows humans to sustainably cycle materials through its habitat service sub-systems).

4.2.1 The production calculation function

The **production function (production efficiency macro-calculation)** exists to maximize the design efficiency of solutions to human economic-resource fulfillment (note: this is a rule structure). The sustainability of a society can be planned through the use of a production protocol (function, $\mathbf{f}_p$) in which the properties of all planned [habitat service phase] elements are maximized (→ *max*):

Protocol: $\mathbf{f}_p(\mathbf{E}_{design}, \mathbf{E}_p, \mathbf{E}_{dist}, \mathbf{E}_r) \rightarrow max$

This is a protocol: production [of service-products, solutions] is a function that includes (a calculation of total design efficiency, a calculation of production efficiency, a calculation of distribution efficiency, a calculation of recycling efficiency) all of which are to be maximized.

Wherein,

1. $\mathbf{f}_p$ - a production **function[al]**

   A. $\mathbf{E}_{design}$ - total design efficiency
   B. $\mathbf{E}_p$ - **production** efficiency
   C. $\mathbf{E}_{dist}$ - **distribution** efficiency
   D. $\mathbf{E}_r$ - **recycling** efficiency
   E. → *max* - maximize

A solutions (products) must meet or adapt to the current efficiency standard. All designs must adapt to:

1. Optimized design efficiency function (sub-process).
2. Optimized production efficiency function (sub-process).
3. Optimized distribution efficiency function (sub-process).

4. Optimized recycling efficiency function (sub-process).
5. Optimized recycling conduciveness function (sub-process).

4.2.1.1 The optimized design efficiency process (process 1)

The efficiency of a design ($\mathbf{E}_{design}$) can be described by a design function ($\mathbf{f}_{design}$) in which the properties of all planned design elements are maximized:

$$\mathbf{E}_{design} = \mathbf{f}_{design} (\mathbf{t}_d , \mathbf{A}_{design} , \mathbf{N}c , \mathbf{c}_r , \mathbf{H}_L)$$

Design efficiency = the current design efficiency standard, which is a function of the optimization of (maximized durability, maximized adaptability, maximized standardization, maximized recyclability, maximized automation)

The current efficiency standard is labeled as: $\mathbf{E}^i_{design}$

Wherein,

1. $\mathbf{E}_{design}$ - **total design efficiency**

   A. $\mathbf{E}^i_{design}$ - the current design efficiency **standard**
   B. $\mathbf{f}_{design}$ - design efficiency **function[al]**

   1. $\mathbf{t}_d$ - evaluative sub-process to determine **durability** of design and compute acceptability.
      i. Designs are strategically maximized for durability; strategically maximized durability. Designs account for performance loss due to environmental extremes and time under usage/storage. For example, in concern to performance loss, lithium battery operation fluctuates with temperature. Early 21st century electric lithium car batteries are at their peak performance when the weather is 21c. Anything above or below that will result in a significant performance loss, which must be accounted for.
   2. $\mathbf{A}_{design}$ - evaluative sub-process to determine **adaptability** of design and compute acceptability.
      i. Designs are strategically maximized for adaptability; strategically maximized adaptability.
   3. $\mathbf{N}c$ - evaluative sub-process to determine minimum number of **genre components** of design and compute acceptability.
      i. Designs are strategically maximized for standardization; strategically maximized standardization.
   4. $\mathbf{c}_r$ - evaluative sub-process to determine **recycling** conduciveness of design and compute acceptability.
      i. Designs are strategically maximized for recyclability; strategically integrated recycling conduciveness.
   5. $\mathbf{H}_L$ - evaluative sub-process to determine **human effort** expenditure (or "labor") of design and compute acceptability.
      i. Designs are strategically maximized for automation; strategically conducive for labor automation.

A product's design (i.e., a solution) must meet or adapt to these criteria. The efficiency of a design is conveyed

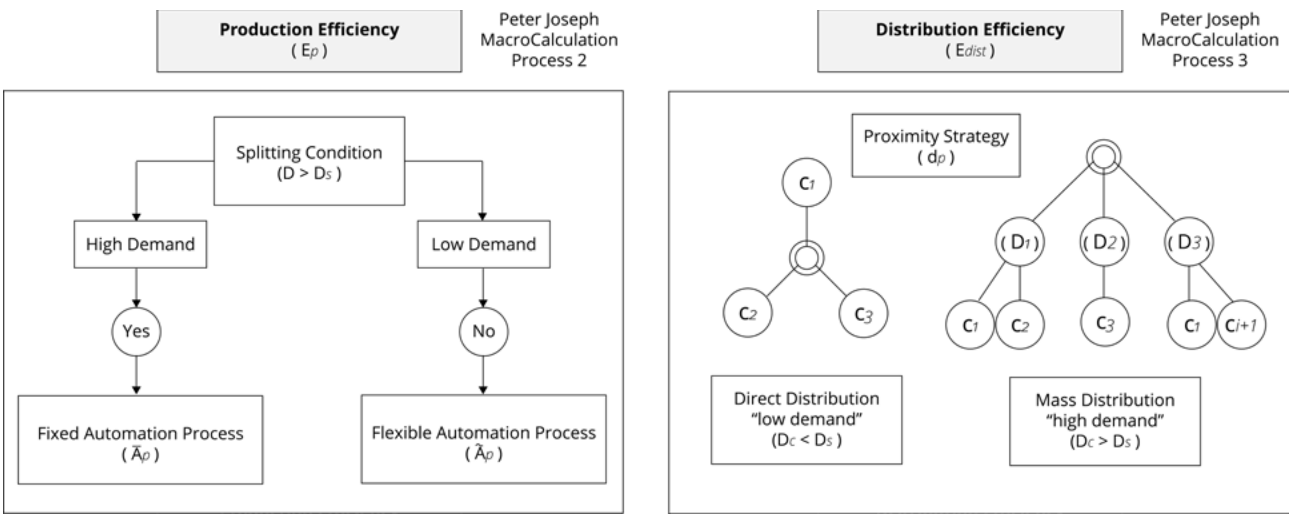

Figure 38. *Macro-economic calculation for production efficiency and distribution efficiency processes.*

by how well it meets the specified efficiency criteria set by the current efficiency standard E^i_{design}. And, what a population desires is the maximization of functional efficiency.

The five evaluatively efficiency inquiry sub-processes are:

1. **Strategically maximized durability (t_d)**

   Maximized durability is an element of the current design efficiency standard.

   A. [Strategically] Maximized durability is calculated as:
      - $\mathbf{t}_d \in \mathbf{E}^i_{design}$

   B. Total durability is a list of the durability of all individual components of a system:
      - $t_d (d_1 , d_2 , ... , d_i)$

   C. It is possible to optimize the durability of each designed component:
      - $d^o_1 , d^o_2 , ... , d^o_i$

   D. Maximize total durability of all components of the solution or system, by optimizing each individual component to its maximum:
      - $t_d (d_1 , d_2 , ... , d_i) \rightarrow \max , t_d = t_{max} (d^o_1 , d^o_2 , ... , d^o_i)$

      Solutions ought to be produced as strong and long-lasting as relevant, based on materials selection and materials replacement (i.e., interchangeability). Optimized durability refers to the strategic material integrity of the projected [service] system, and also, its outputs (i.e., usable products/goods; technology). Herein, the concept, "strategic", is important; it qualifies the optimization of durability to account for the factor of time in its operatively predictable [lifespace].

      This micro-calculation is a synergistic design calculation [upon a network transport protocol] where the notion of the "best" material for a given purpose is always relative to other inputs; notably, the parallel production needs that also might require that type of material. A 'community' does not "waste" materials; it coordinates the utilization of materials. In other words, the decision to use a specific material is assessed not only for its use in a specific [construction] task, but also by comparing it to the needs of other productions (pre and post, and trending), which require similar efficiency.

Nothing exists outside this systems-centric comparison. All production decisions (modifications to our common heritage) are made with consideration of the largest system as our reference, and they are transparent.

In concern to planning, a "service production's" life [space] is planned for, so that we may

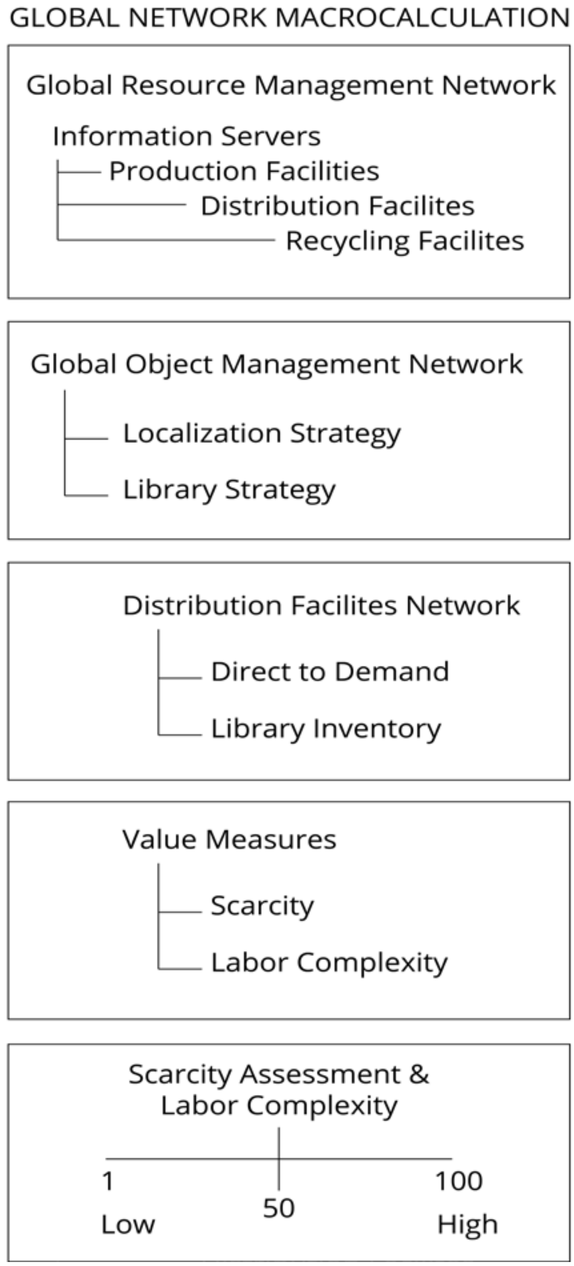

Figure 39. *Simplified macrocalculation for a global access network.*

replace (i.e., 'extropy' - export entropy) and interchange.

2. **Strategically maximized adaptability (A_{design})** - design for the highest state of flexibility for replacing component parts in engineered product[ion] services. Here, designs facilitate the ease of replacement of components and services as needed [through modularity standardization] to maximize the full lifespan of the product[ion] (Read: calculate for '*extropy*' - the exportation of entropy by replacement). Different production components have different rates of change and this means a system of "adaptability" and active "updating" can be foreshadowed through trend analysis, with the resulting [predictable] expectations built into an existing design to the best degree possible. When products are integrated into "production services", then adaptation can be *modularized*, systematically producing a more resilient form of a system.

   At the core of "lifespace/lifetime design" is design-for-disassembly and for modularity. Design-for-disassembly is synonymous with a user's ability to "look under the hood" of a certain device (if it just open source or in the case of AI, it assists you in understanding itself), and to audit its systems. Whereupon, interface modules are physically efficient interchangeable units of functionality; they have 'compatibility'. Modules are interchangeable units of functionality.

   Optimized adaptation occurs [in part] due to universal standardization (or 'integration'), and the structures that are produced may be said to be "integral" to the overall purpose of the system. Essentially, services and products are designed to be modified, adapted, and otherwise update through 'integrated modularity'.

3. **Strategic and universal standardization of genre components (N*c*) | Interoperability** - all new designs either conform to or replace [if they are updated] existing component designs, which are either already in existence or outdated due to an evolution in technical efficiency. In other words, compatibility is being accounted for here. "Genre" standardization includes not only the standardization of a product, but is more specifically referring to the application of standardization throughout the whole of the habitat service system. Universal standardization is essentially a set of optimized protocols set upon a massive parallel information sharing transport [protocol] network. The result is a universal compatibility of all components associated to a given service genre. In early 21st century society, this lack of standardization is a source of not only great waste, but great instability in the functioning of common goods and its stressful inefficiencies have social ramifications. This logic applies to every scale of genre component, from the habitat service systems themselves to itemized in-service technical productions. Essentially, production services are standardized in prototypical ways through trusted protocols that maintain a continuously integrated dynamic. The elements of a system must be compatible.

   Herein, strategic standardization is represented by the variety of genre components available:

   $$\mathbf{g}^1{}_c\,,\ \mathbf{g}^2{}_c\,,\ldots,\ \mathbf{g}^i{}_c\,,\ldots,\ \mathbf{g}^{Nc}{}_c$$

   The goal of a trusted and cooperatively explored environmental "game" is to work together to minimize the total number of genre components (**N***c)* in our creations. Herein, the standardization of the trust processes will enable the potential of lowering the number **N***c* to its possible knowable minimum.

   It is optimal to simplify the way materials and the means of production are used, so that the maximum number of goods can be produced with the least variation of materials and production equipment for the highest potential fulfillment of everyone.

4. **Strategically integrated recycling conduciveness (c_r)** - every design must conform to the current state of re-cyclable possibility. The dissassembly and/or breakdown of any good must be anticipated and allowed for in the most optimized way. The current state of component and material re-use is optimized within the very design of the [production] service itself. Note, this does not happen in early 21st century society, in any efficient way. In the Community, when a products useful lifespan is complete, then it is returned for direct reprocessing. Herein, there are de-composition and recycling protocols, which are built into the manufacturing system.

   The system is optimized toward "closed loop" manufacturing where 'waste' is the feedstock for other life essential processes. Fundamentally, there is no such thing as "waste" in the natural world. In early 21st century society, most people give very little consideration to the role of material regeneration, and how the design practices of any given society must account for this if it is to remain sustainable. It may be interesting to note here that the very idea of 'regeneration' has a detrimental impact on market competition, for it connotes its design corollary, 'abundance' -- abundance de-constructs markets. An abundance of any material resource will either reduce price/profit for market entities that deal in the commodity, or it will kill the market for the material entirely.

The idea of "cradle-to-cradle design" (or re-cycleability and compatibalism) refer to the idea that once a product is obsolete 100% of the material can be used elsewhere, which may involve inclusion in another technology or decomposition into a more elemental form.

5. **Strategically conducive for labor (H_L) and automation (A_L)** - this means that the current state of optimized and automated production as well as human [labor] input is directly taken into account. This is denoted by human labor **(H_L)** and automated labor (**A_L**). Automated labor refers to the application of "mechanization". All transactional [task] effort may be calculated so that we have the automation conduciveness/applicability data [probabilities] available to us in decisioning. Herein, the design of decisions are the most conducive to the current state of production with the least amount of human energy expenditure, where humans desire. This means that a given service design will account for the dynamic state[d mixture] of labor and automation; wherein, we design the removal of human involvement whenever desired possible by more by efficient design. Also, part of the efficiency equation is to make the production easy to re-produce by automated means, taking into account the current state of automation technology.

   We understand the benefits of "appropriate automation" of production or other tasks whenever repetitively banal, dangerous, or otherwise intrinsically unrewarding. These tasks can be carried out with computer robotics assistance in place of human labor.

   Herein, two general facility types are distinguished: one for high demand or mass production and one for low demand or short-run, custom goods. The high-demand facility is a more "fixed-type" system and the short-run demand facility is a more "flexible-type" system. "Fixed automation", also known as "hard automation," refers to an automated production facility in which the sequence of processing operations is fixed by the equipments configuration. It is fast, but has less variation in output design capacity. "Flexible automation" can create more variation, but the disadvantage is the time required to reprogram and change over the production equipment. These terms are common to the manufacturing and robotics industry when it comes to production facility design.

   Human effort (labor) is reduced to its desired design minimum:

$$\mathbf{H}_L / (\mathbf{H}_L + \mathbf{A}_L) \rightarrow \min$$

   This is the expression in its expanded form:

$$\mathbf{H}_L (\mathbf{I}_1 ,..., \mathbf{I}_i) / \mathbf{A}_L (\mathbf{I}_1 ,..., \mathbf{I}_i) \rightarrow \min$$

   Here, labor complexity means estimating the complexity of a given production. Complexity, in

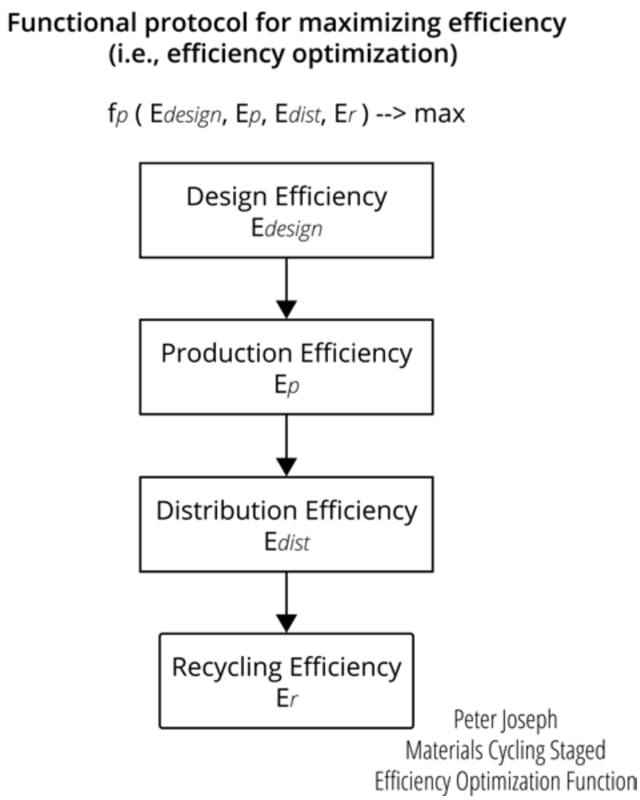

Figure 40. *Macro-economic calculation for maximization of total efficiency during the materials cycling process stages of design, production, distribution, and recycling.*

the context of an automated oriented economic sector can be quantified by defining and comparing the number of “process stages”. Any given good production can be foreshadowed as to how many of these “stages”of production processing it will take. It can then be compared to other good productions, ideally in the same genre, for a quantifiable assessment. The units of measurement are the stages, in other words. For example, a chair that can be molded in 3 minutes, from simple polymers in one process will have a lower ‘labor complexity’ value than a chair which requires automated assembly down a more tedious production chain with mixed materials.

Levels of automation score (levels of automation):

1. Automated without human supervision control and self-sustaining (full automation, no human effort required)
2. Automated with human supervision control and self-sustaining
3. Automated with human supervision control and non-self-sustaining

These three levels include:

1. Monitoring; supervisory control (automated or human).
2. Human operations management - work flow, stepping the process through states to produce desired end result. Maintaining and optimizing the process: shifts, hours, minutes, seconds.
3. Strategic planning and logistics for automation. Establishing the planned schedule, metered use, delivery of automation in years, months, weeks, days, shifts.
4. Sensors to automate data collection.
5. Algorithms to automate data processing.

4.2.1.2 The optimized production efficiency process (process 2)

Production efficiency is notated as: $\mathbf{E}_p$

Production efficiency ($\mathbf{E}_p$) moves a demanded production to one of two production facility types*:

1. High demand (mass products)
2. Low demand (customized products)

** This is a common distinction in manufacturing*

A class determination is used to split demand into two [production] categories with a splitting variable, $\mathbf{D}_s$. Here, the choice of production type/facility is based upon the nature of the production's requirements. The following expression represents the splitting condition (is a simple decision with a threshold calculation):

If $\mathbf{D} > \mathbf{D}_s$ Then $\bar{A}_p$ Else $\tilde{\mathbf{A}}_p$

All product designs are filtered by a demand class determination process (**D**). The demand class determination process filters based on the standard demand splitting value ($\mathbf{D}_s$) set for low demand or high demand. All low consumer demands are to be manufactured by the flexible automation process and all high consumer demands are to be produced by the fixed automation production process.

If demand is greater than the splitting value of demand, which is a threshold, then fixed automation is used; and, if it less than the threshold value, then flexible automation processes are used for production.

The ‘high demand’ category assumes fixed automation $\bar{A}_p$ **($\mathbf{a}_i$)**, meaning unvaried production methods ideal for high demand/mass production. The ‘low demand’ category uses flexible automation $\tilde{\mathbf{A}}_p$ **($\mathbf{t}$, $\mathbf{D}_c(\mathbf{t})$, $\mathbf{a}_i$)**, which can produce customizations, but usually in shorter

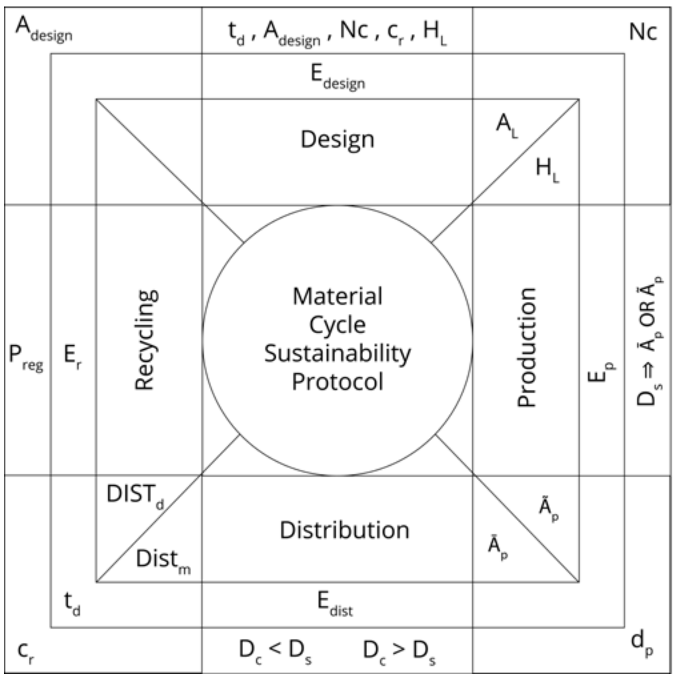

Figure 41. *Material cycle sustainability macro-calculation function. The four phases of the development of service systems with common resources are: design, production, distribution, and recycling. This is an optimization function for the maximization of efficiency in order to cycle materials sustainably throughout the habitat. This protocol combines with economic calculations and a parallel inquiry process in order to materialize service systems for the mutual fulfillment of all of humankind.*

runs. Hence, this schematic assumes only two types of production facilities are needed (fixed and flexible automation). However, there could be more production facility types based upon production factors that generate more splitting conditions.

For example, most product designs are filtered by a **demand class determination** process. The demand class determination process filters based on the standards set for [Low Demand] or [High Demand]. All Low Consumer Demand product designs are manufactured by the 'Flexible Automation' process. All High Consumer demand product designs are to be manufactured by the 'Fixed Automation' process.

The manufacturing of all demand (low and high consumer demand) products designs will be regionally allocated for production as per a Proximity Strategy ($\mathbf{d}_p$) of the manufacturing facilities.

4.2.1.3 The optimized distribution efficiency process (process 3)

Distribution efficiency is notated as: $\mathbf{E}_{dist}$

After process 2, the product design is now a product to be distributed to the consumer (user). At this stage, there is the application of optimized distribution efficiency. Most products are allocated to occupying entities with some georeferenced location.

As with process two, there are two categories for demand, each with a separate distribution process:

1. Low User Demand (a.k.a., low consumer demand) products follow the 'direct distribution' process ($\mathbf{DIST}_d$).
2. High User Demand service productions follow the 'mass distribution' process, which would likely be the libraries, access centers, or direct to user where possible ($\mathbf{DIST}_m$).

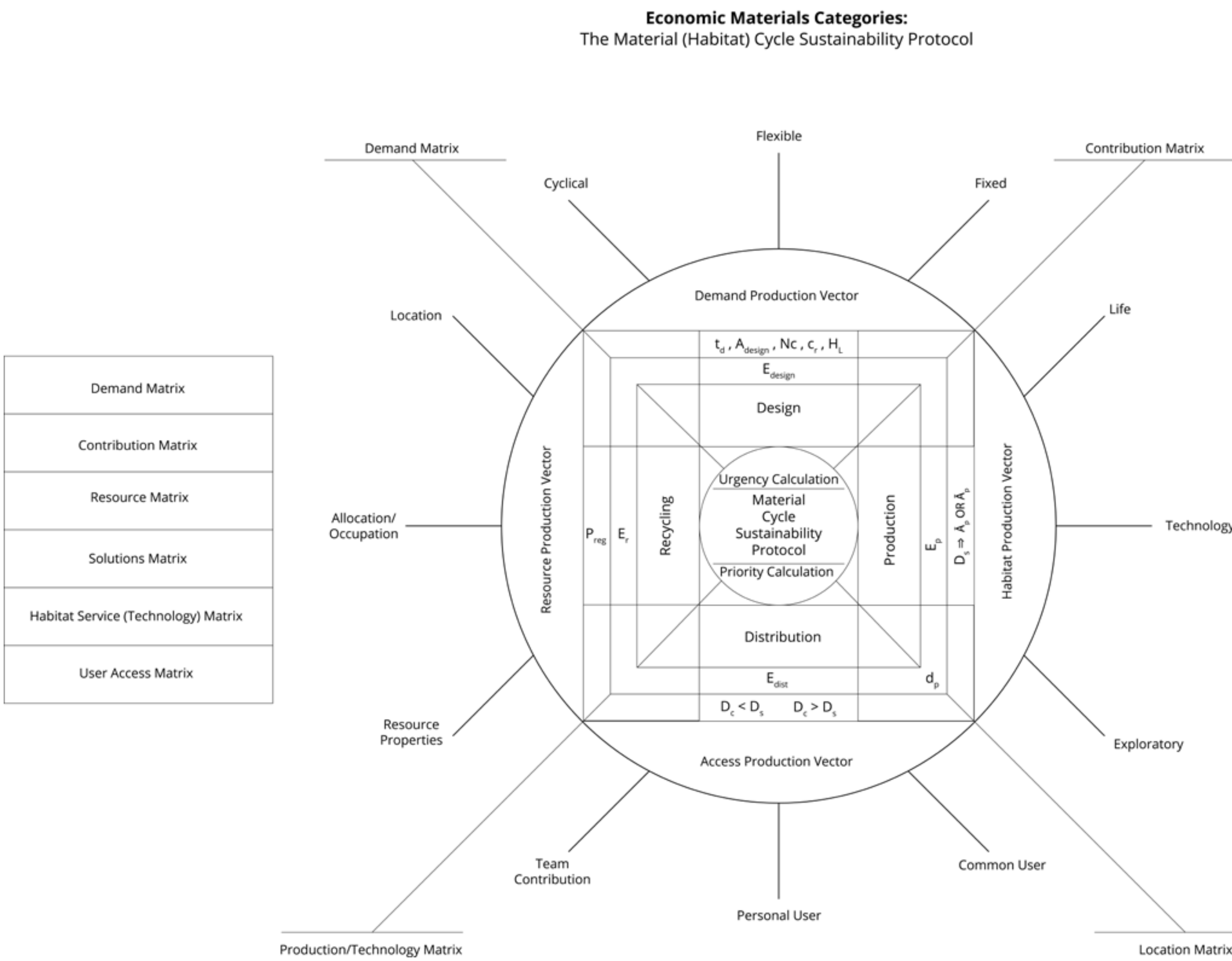

Figure 42. *Figure shows the matrices that must be designed and calculated for by the production decision protocol.*

Both the Low User Demand and High User Demand product will be regionally allocated as per the Proximity Strategy ($\mathbf{d}_p$), as before.

A class determination is used to split demand into two [distribution] categories with a splitting variable, $\mathbf{D}_s$. In general, the $\mathbf{D}_s$ for process 2 and 3 are the same $\mathbf{D}_s$.

1. In low usership demand situations ($\mathbf{D}_c < \mathbf{D}_s$) distribution is direct to the user.
   A. Direct distribution - low demand.
2. In high usership demand ($\mathbf{D}_c > \mathbf{D}_s$), distribution is logistically arranged through a planned massive distribution model involving access centers, storage centers, and direct to user elements.
   A. Mass distribution, high demand.
   B. In this case, generally, the product goes to intermediary facilities, such as libraries ($\mathbf{D}_i$) to provide accessibility to the potential users/ consumers ($\mathbf{C}_i$) .

The proximity localization strategy ($\mathbf{d}_p$) involves the prioritization of localization in terms of:

1. **Sourcing** of materials used in production is localized & raw material re-production are localized.
2. **Production** and **recycling** is localized.*
3. **Production machinery** used in the production process is localized [at a prioritization scale].*
4. **Distribution** maintains distributed localization.

*** 3D printing** - *localized distributed manufacturing based on digital fabrication. 3D printing is a form of localized and distributed production.*

4.2.1.4 The optimized recycling efficiency process (process 4)

Recycling efficiency is notated as: $\mathbf{E}_r$

Products, materials and their life-cycles, may be designed for recyclability (recycling) and/or reuse (re-use) in the following ways:

1. Produced objects can be re-used and re-purposed:
   A. Produced objects can be re-used - whole or part of the product is simply re-used.
      1. The most basic form of re-use is a library, but this is outside the context of production. Here, no part of the object is replaced; the product is directly resued (i.e., this is direct re-use).
      2. In concern to production, when objects are returned to maintenance, and a part is replaced, the rest of the object is not replaced, it is simply re-used (possibly with cleaning). This is "parts-replacement" reuse (i.e., parts re-use).
   B. Produced objects can be re-purposed (a.k.a., up-cycled) - all or part of the product is re-purposed for another use. This occurs when components are not recycled, but instead re-purposed into another production cycle (typically, for a different product).
2. Produced objects can be disassembled mechanically, chemically, and electromagnetically:
   A. Mechanical recycling - changing the object via mechanical methods to make it more usabale or de-composible.
   B. Chemical recycling - changing the object via chemical methods to make it more usable or decomposible.
   C. Electromagnetically recycled - changing the object via electro-magnetic methods.

Protocol: All voided (no longer used) products will follow a recycling-regenerative protocol:

- $\mathbf{P}_{reg}$ is the primary regenerative protocol for $\mathbf{E}_r$.
- The $\mathbf{P}_{reg}$ protocol includes a scarcity measurement for resources (materials) and solution resource configurations (in which resources may be locked for periods of time). The scarcity value is placed on a numerical scale from 1 to 100. One would denote the most severe scarcity with respect to the current rate of use - and 100 the least severe. Fifty would mark the steady-state dividing line. For example, if the use of wood lumber passes below the steady state level of 50 - which would mean consumption is currently surpassing the earth's natural regeneration rate - this would trigger a counter move of some kind - such as the process of 'material substitution' (for example, the replacement for wood in any given future productions, finding alternatives).

5 Assembly complexity index and analysis

A.k.a., Product complexity, production complexity, assembly complexity inquiry, assembly complexity index analysis and inquiry assembly index, assembly theory, account for object history and reproducible recursions, complexity analysis, hierarchy analysis.

Assembly thinking deals with understanding how parts come together to form a whole and the implications of this process. In the realm of system assembly, the term "assembly" denotes not only the physical [construction of] objects, but also their complexity and the historical context of their development. Identifiable by their replicable forms, objects serve as the cornerstone for understanding assembly complexity. The process of assembly delineates the evolution of these objects, emphasizing the significance of their formation and the intricacies of their interconnections within a system. System assembly thinking accounts for objects for which identical copies can be found, and analysis therein allows for determinations of whether those objects are complex or not.

The organization and integration of components into complex structures is essential for understanding how different parts of a production system come together to function as a whole. Assembly complexity analysis examines the factors involved in assembling components into a final product (e.g., a habitat), including the identification of bottlenecks or inefficiencies. Herein, the result of the analysis is an assembly index for every produced service-object that acts as a quantitative measure that evaluates the complexity of assembling a product from its components. This can guide optimization efforts by highlighting areas where simplification can reduce costs and improve efficiency.

Assemblies are characterized by the following attributes:

1. **Contingent histories:** An assembly describes the possible historically formative steps/histories of objects. Each assembly carries a unique

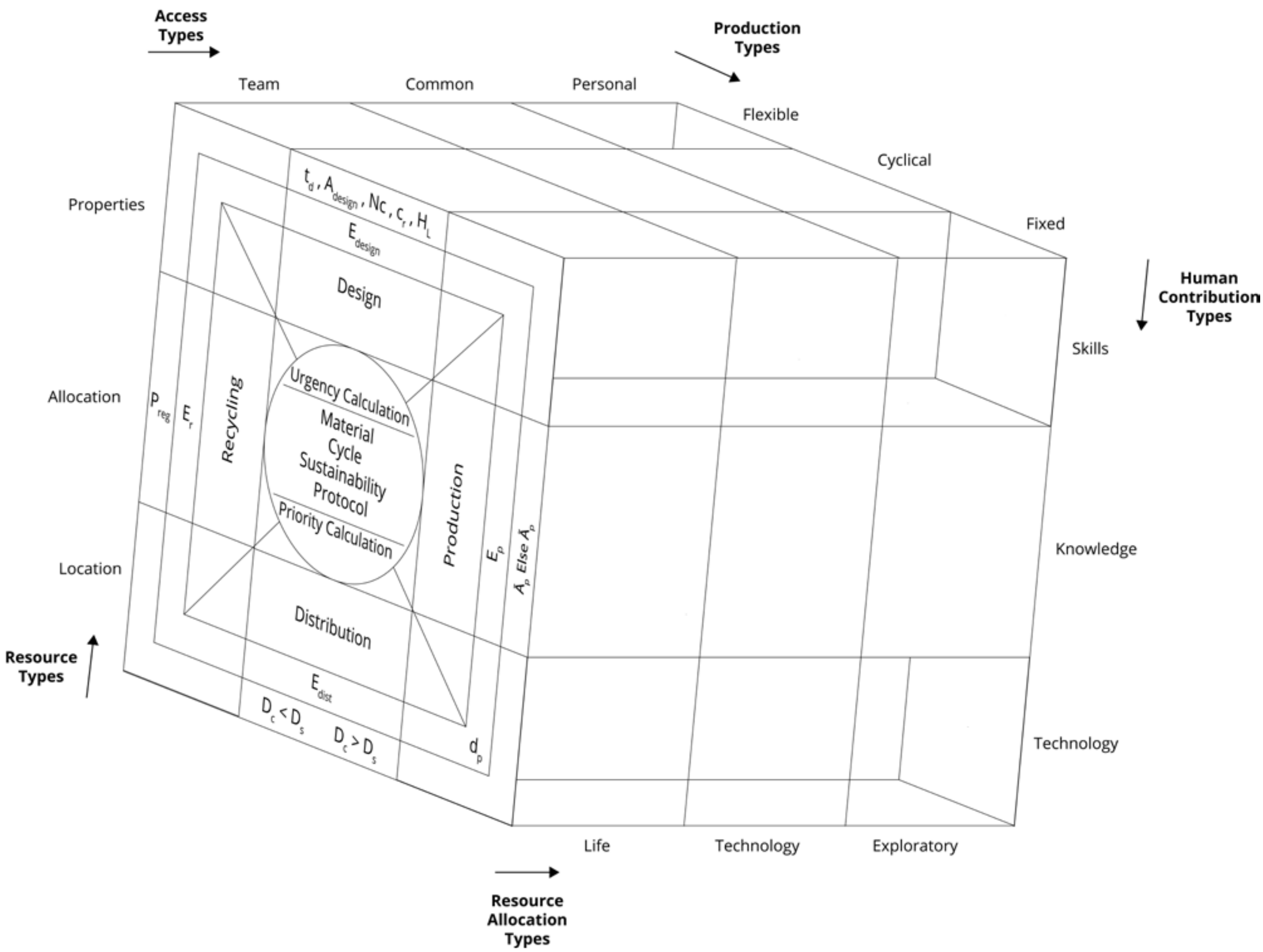

Figure 43. *Figure shows a three dimensional matrix for the production calculation.*

developmental history, contingent upon various factors that have led to its current state. All assemblies have contingent histories. The assembly formula considers production processes not as static entities but as evolving assemblages with defined formative histories.
2. **Hierarchical composition:** Assemblies are built upon prior levels of construction, where components created at earlier stages become integral to subsequent levels of assembly. The assembly formula counts assembly steps.
3. **Enabling new assemblies:** Existing assemblies lay the groundwork for the emergence of more advanced assemblies, making what was once improbable, possible and viable. Pre-existing assemblies provide the necessary base for developing more intricate and advanced assemblies.
4. **Evolutionary significance:** The process of assembly reflects the evolutionary progression of structures, whether biological, mechanical, or societal. The more technical products already exist, the more innovations become possible by combining them. Combination and selection are the same mechanisms in evolution.
5. **Analytical insight/utility:** Assembly analysis is instrumental in recognizing the complexity within systems and is key to designing efficient and effective structures across various domains of life. The study of assembly processes is crucial for discerning system complexity and is instrumental in the design and optimization of both technical and socio-technical structures.
6. **Dynamic and static complexity:** Assembly complexity can be viewed through the lens of both static and dynamic states of objects—ranging from the tangible (solids, liquids, gases) to the conceptual (plasma, transfer, addition, and subtraction).
7. **Assembly "space":** This concept captures the knowable parameters of assembly—the number of steps required and the complexity inherent in each step. It maps out the pathway an object takes from its most basic components to its final form, reflecting the system's memory. It can include a host of other variables related to assembly, such as power usage, labor time, etc.

All technologies, and all socio-technical organizations, are assemblies with different levels of assemblage and complexity, wherein:

1. Concepts plan or describe the movement of objects.
2. Objects are located to exist and may be moved into positions (locations), orientations (directions), rotations (spins), and translocations (two or more locations).

Herein, assembly complexity can be seen from two viewpoints:

1. Assembly complexity using the static objects (solids, liquids and gas).
2. Assembly complexity using the dynamic concepts of objects (plasma, transfer, addition, and subtraction).

Any assembly has two core static, knowable values (a.k.a., assembly "space"; i.e., A assembly complexity inquiry, analysis includes the following factors of assembly):

1. **Number of steps to assemble.**
2. **Complexity of assembly at each step.**
   A. Mineral resource usage (MR).
      1. Fixed.
      2. Transitory.
   B. Non-mineral resource usage (nMR).
      1. Fixed.
      2. Transitory.
   C. Power resource usage (PR).
   D. Labor resource usge (LBR).

Within the context of human habitats, which are complex socio-technical systems, the principles of assembly are applied to construct and coordinate living services. These habitats are step-by-step compositions of varying complexity, serving as the prototypical units of community assembly. They encapsulate a mix of concepts and objects designed to fulfill a spectrum of functions. Within each habitat, support services are categorized and accessed through layers of personal, communal, and InterSystem teams, culminating in a global network that represents the broader supra-assembly of interconnected habitats.

Objects represented in an information system, have histories to their formation (as an intrinsic property), mapped as an assembly space. The assembly "space" is defined as the pathway by which a given object can be built from elementary building blocks, step-by-step, using only recursive operations. For the shortest path, the assembly "space" captures the minimal memory, in terms of the minimal number of operations necessary to construct an assembled object based on objects that could have existed in its past. Here, it is the total set the of currently existing products, and their feedback relationships that constitute the memory of the system. Of note, a mode of production also has memory encoded into the set of products it currently produces and hold stocks of. (Sharma, et. al., 2023)

The assembly formula, expressed through summation notation, can be used to measure (in the context of complexity) the shortest path required to reconstruct (copy) a system, reflecting its degree of complexity and potential evolutionary history. All assemblies are composed of a number of steps, that lead to the assembly of objects into a supra-functional objects (Read: target assemblies). In community, habitats are socio-technical assemblies with different levels of construction and operation complexity. Habitats are constructed and operated through step-by-step procedures, with varying degrees of complexity at each step. In community, the habitat unit is the prototypical complex of a useful mix of concepts and objects. Here, habitats are the prototypical user assembly unit. Within each habitat there are three primary categories of support service; each with its own set of sub-assemblies (all accessed within the context of personal, common, and InterSystem team access). The global (networked habitat configuration) is it's supra-assembly.

Assembly pathway are initialized and composed of:

1. **A set of basic building blocks** (there are objects at the beginning).
   A. Masses (objects).
   B. Information (concepts).
2. **Joining operations** construct the assembly with blocks (events and actions occur to objects and concepts).
   A. Knowledge (information technology).
   B. Tools (physical technology).
3. **Re-use** (Read: reproduction, recursion; wherein, there is memory of what is made, memory of assemblages of objects).

Once the pathway for a new object has been discovered, the production of an object (copy number greater than) gets easier as the copy number increases; because, a high copy number implies that an object can be produced readily in a given context. Thus, the hardest discovery is making an object for the first time, which is equivalent to its discovery, followed by making the first copy of that object. But, once an object exists in very high abundance, it must already be relatively easy to make. Hence, the overall assembly complexity (A) scales linearly with copy number for more than one object (for a fixed requirements set ("cost") per object), once a process (object+technique) has been discovered. (Sharma, et. al., 2023)

An assembly, as a unit of functional data, captures the amount of memory necessary to produce a selected configuration of a historically contingent object assembly, by usage of some materials and techniques. Here, the definition of 'object' is simple and rigorously defined. An 'object' is finite (has shape), is distinguishable, persists over time and is breakable (divisible to atoms and threads) such that the set of constraints to construct it from elementary building blocks is quantifiable (measurable) and with qualifiable utility (functionable). A more generalized conception of an object-assembly is anything that can be broken and built.

The more complex a given object, the less likely an identical copy can exist without selection of some information-driven mechanism that generates that object. An object that exists in multiple copies allows the signatures describing the set of constraints that built it to be measured experimentally. More copies of the object mean more "abundance" of that object.

At the molecular level, there are tools to measure types and arrangements of molecules. Mass spectrometry is one such tool that can be used to measure assembly for molecules; because, it can measure how molecules are built by making bonds.

The more complex a given object, the less likely an identical copy can exist without selection of some information-driven and power-driven mechanisms that generates that object. An object that exists in multiple copies allows the signatures describing the set of constraints that built it to be measured experimentally and reverse engineered.

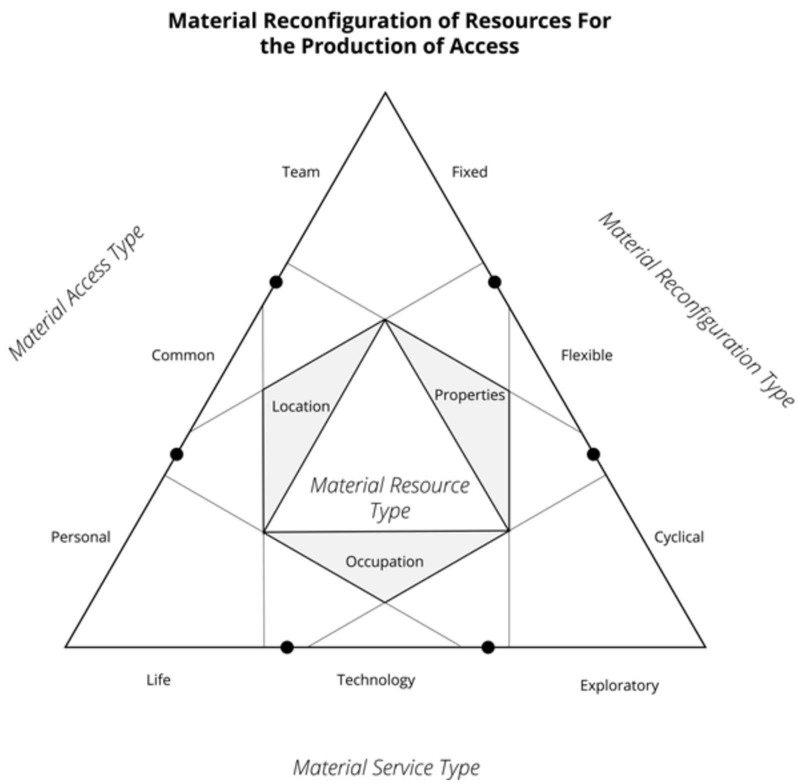

Figure 44. *Diagram of the convergence of access, reconfiguration, and service through the allocation of resources with properties to specified locations.*

The key observable properties of objects are (an assembly is a function of two quantities) (Sharma, et. al., 2023):

1. The number of copies of the observed objects.
   A. Copy number (copy count).
2. The objects' assembly index (quantify one or more factors of an assembly process; such as, steps on a minimal path to producing the object or the complexity of the object itself).
   A. Assembly index value, result, "A" or "AI".

CLARIFICATION: *The term "index" does not refer to the variable "i". Here, "index" refers to the assembly index "A" or "AI", which is a calculated value representing some aspect of an assembly's composition.*

The properties of an assembly are definable using mathematical formula. The assembly index (AI or A) formulae assess a composite measure (e.g., complexity, "steps","concentration", etc.) based on individual component contributions, but the specific variables and their interpretations differ, reflecting the distinct contexts in which the assembly formula used.

NOTE: *The most basic example of an assembly index is a flint arrowhead, and the assembly index is the number of steps to shape the tool (using another stone to knap off parts of the final tool.*

The value of the overall assembly complexity (A) gives manufacturers and designers an idea of how complex the assembly process will be, which can influence the cost, time, and feasibility of manufacturing a product. A higher assembly index suggests a more complex and potentially time-consuming and costly assembly process, whereas a lower index indicates a simpler, likely more cost-effective assembly.

The term "index" in the context of "assembly index" and other similar metrics originates from the Latin word "indicāre," meaning to indicate or to point out. In various academic, scientific, and practical fields, an index serves as a quantitative indicator or a measure that points out or reveals the relative position, value, or condition of a subject under consideration. The use of "index" in such terms signifies its role in providing a standardized reference point for comparison, evaluation, or measurement. The index for which the assembly is being compared to is the economization of human need fulfillment (i.e., efficiently and effectively meeting human need completion, cyclically).

The choice of the word "index" in terms like "assembly index" emphasizes the function of these metrics as tools for revealing insights into specific aspects of interest, in this case, the assembly process, and in specific, the number of assembly steps and complexity. By quantifying complexity or efficiency, the assembly index serves as a pivotal reference in economic/habitat production decisioning, embodying the etymological essence of indicating or pointing out critical information.

Assembly indexing is the process of indexing different assemblies based two real-world quantizable phenomena:

1. The difficulty (intelligence and complexity) of discovering a new object, and, once discovered,
2. The difficulty of copying the object (which, becomes easier to make, easier to replicate/duplicate, and apply recursive decision-production, over time),
   A. which, is indicative of how intelligent selection was required to discover and make it in the first place. (Sharma, et. al., 2023)

In application, objects are defined as histories (an intrinsic property of their formation, an "index"), mapped as an assembly "space". The assembly "space" is defined as the pathway by which a given object can be built from elementary building blocks, using only recursive operations. For the shortest path, the assembly space captures the minimal memory, in terms of the minimal number of operations necessary to construct an observed object based on objects that could have existed in its past.

The assembly index can be estimated from any complex discrete object with well-defined building blocks, which can be broken apart. At every step, the size of the object increases by at least one. The number of total possible steps, although potentially large, is always finite for any object (because, all objects are finite only), and thus, the assembly index is computable in finite time. Finding more than one identical copy indicates presence of a non-random process generating the object. (Sharma, et. al., 2023)

To construct an assembly space for an object, one starts from elementary building blocks comprising that object and recursively joins these to form new structures, whereby, at each recursive step, the objects formed are added back to the assembly pool and are available for subsequent steps. (Sharma, et. al., 2023)

For any given object i, define its assembly space as all recursively assembled pathways that produce it. For each object, the most important feature is the assembly index "AI", which corresponds to the shortest number of steps (least complexity) required to generate the object from basic building blocks ("lengths"):

1. Chemical assembly "length" (micro-resource assembly).
   A. Chemicals (and micro-organisms).
   B. Bonds.
   C. Bonds to time, and intermediary production materials to time.
2. Frictional assembly "length" (macro-resource assembly).
   A. Mineral and biologics.

   B. Distance.
   C. Distance to time, and pressure to time (acceleration and reproduction).
3. Electromagnetic assembly "length" (information-communication).
   A. Electric minerals and synthetic phtosynthesis.
   B. Electromagnetism.
   C. Power to time, and signal to time.
4. Computational assembly "length".
   A. Computers.
   B. Mathematics.
   C. Compute to time, and intelligence to time.

A even more simplified way of looking at the hierarchical building blocks of all assemblies is:

1. Atoms.
2. Minerals:
   A. Elements.
3. Biologics:
   A. Simple organic molecules.
   B. Amino acids and nucleotides.
   C. Proteins and DNA chains.
   D. Cells.
   E. Multicellular organisms.
4. Ecosystems of mineral and biological objects.

In this way, assembly-complexity accounting can be done for each of the phases of production:

1. Materials assembly index (MA).
2. Means of [habitat] production assembly index (MeA).
3. Final [habitat] service-object assembly index (SA).
4. Disassembly assembly index (DA).

It is relevant to note here that there are similarities between assembly step analysis and algorithmic information dynamics (a.k.a., algorithmic information theory). In assembly-step complexity analysis, the result is a measure ("index") of an object's complexity, but it is not a measure of algorithmic complexity (and yet, it could be considered algorithmic, if a copy is the target of analysis, because of the algorithmically recursive steps needed to reproduce it as a copy). The assembly index (ai) is the smallest number of joining operations needed to create an (assembled) object. It is based on the idea that the formation of complex structures depends on specific assembly pathways. The final product depends on the initial conditions and the "story" (history) of the assembling building blocks. The assembly index (ai) is a measure of an object's complexity, but it is not a measure of algorithmic complexity. Algorithmic information dynamics relates to, but does not undermine the usage of assembly-step analysis for life detection and production economization. The reasons for this are: 1) assembly indices are not intended to be optimal measure of compression (although they are alike), and 2) assembly theory deals with the problem of randomness by focusing on copy number, which is not directly considered in algorithmic information dynamics.

5.1 Summation formula notation

A.k.a., Summation notation, sigma formula

Summation formula notation is a mathematical convention used to express the sum of a sequence of terms that follow a specific pattern, which is defined by the formula inside the summation. The sigma sum notation, denoted by the Greek letter (Σ), which is a mathematical symbol that indicates the summing of a sequence of terms defined by a formula. This compact representation allows for the concise expression of long sums, where the variable beneath the sigma indicates the starting index and the variable above denotes the ending index of the summation.

The formula useful in assembly complexity and economic production plan analysis because it provides a quantitative framework for aggregating individual assembly attributes across an entire system, enabling precise evaluation of overall production intricacies. By incorporating the complexity factors of each component into a single index, it allows for the optimization of design and resource allocation, thereby facilitating more efficient and cost-effective manufacturing strategies.

The sigma-sum formula:

Sigma formula | Sigma notation

$$\underset{\textit{index (i)} >\ i\,=\,1}{\textit{sum | sigma} \ (\textstyle\sum) >} \sum_{i=1}^{2} (3i-1) \quad \begin{array}{l} \textit{< end value (last value, 2)} \\ \textit{< rule/formula (...)} \\ \textit{< start value (first value, 1)} \end{array}$$

- wherein,
  - i = index, or any letter used to represent the running index counter that iterates over the sequence the index tracks which term the sequence currently being summoned.

5.1.1 Assembly complexity factoring

A.k.a., Assembly factor, complexity factor.

In each version of the assembly summation notation form, the complexity factor (assembly index) a_i can be used in three ways:

1. a_i as the "Complexity Factor" of the i^{th} **type/unit of 'object'**.
   A. a_i reflects the inherent complexity in production (manufacturing, assembling, disassembling, etc.) a particular type of object. For example, if the object is a microprocessor, a_i would be high due to the complex design, and resource and technique precision required.

2. a_i as the "Complexity Factor" of the i^{th} **copy of 'object'**.
   A. a_i varies for each copy of an object, possibly reflecting variations in the production process or differences in materials used for different batches.
3. a_i as the "Complexity Factor" of the i^{th} **assembly step of 'object'**.
   B. a_i is specific to each step in the assembly process. For example, soldering components onto a circuit board might have a different a_i compared to testing the completed board.

Using summation notation to construct an assembly complexity index of [habitat] service-objects allows for:

1. Evaluating and comparing the complexity of different products.
2. Optimizing individual steps in a [societal-habitat service system] production (i.e., assembly line).

5.1.2 Exponential assembly complexity index analysis

In step analysis, the overall assembly complexity index (A) is defined as the length of the shortest assembly pathway. Framing the assembly index as the number of steps necessary to assemble something shifts the perspective to the complexity and efficiency of production processes. Understanding the concept of the "assembly index" of a system is paramount in making informed decisions within society. As a crucial sub-process inquiry, analyzing the assembly index sheds light on the intricacies of production processes, resource allocation, and overall system efficiency. The assembly index serves as a metric to quantify the complexity and efficiency of assembly processes within a system. By delineating the number of steps necessary to assemble a product or execute a process, it provides invaluable insights into resource utilization, workflow optimization, and potential bottlenecks. Consequently, a comprehensive understanding of the assembly index empowers decision-makers to streamline operations, enhance productivity, and allocate resources judiciously to meet community needs effectively.

The exponential assembly-complexity index formula requires:

1. Objects that can be found in identical copies.
2. Identification of whether the objects are complex or not.

Here, the assembly index formula can assume an exponential relationship for complexity modeling, where the Assembly Index (A) is calculated in a way that increases in complexity have a disproportionately greater impact on the assembly index. The following is an exponential assembly index formula where each assembly step has an exponential factor based on its complexity rating. The formula is understood as a sum of terms, each representing an individual assembly step, which accounts for the complexity of that step and its sequence in the overall process. The following basic assembly formula applies to all things that are made out of a hierarchy of components. Here, an assembly is defined as the total amount of selection necessary to produce a secondary 'unit' of objects (assembly), quantified using the equation:

Formula:

$$A = \sum_{i=1}^{N} e^{a_i} \left((n_i - 1) / N_T\right)$$

- where an assembly index of overall complexity, A =
  - a sum over, $\sum$.
    - all possible arrangements/steps of a system, N.
    - combining how complicated they are to assemble, e^{a_i}.
    - multiplied with how many copies are seen, n_i (or, n_i - 1), over
    - the total possible number of objects, copies of objects, or steps in the assembly process, N_T.
  - N = total number of assembly steps -- the last assembly step; the total possible arrangements/steps of the system (starting with *i*=1 and ending with N).
  - a_i = "complexity factor" or "assembly index" of the i^{th} type of object, the i^{th} copy of an object, or the i^{th} assembly step.
    - a_i = number-count of steps to construct the object from sub-components.
    - How many steps are directly required to build; how complicated is it to assemble?
  - e = Euler's number, which is a natural factor that adjusts for the improbability of the object/molecule existing.
    - e is the base of the natural logarithm (approximately equal to 2.71828).
  - e^{a_i} = the exponential complexity factor, where a_i represents a complexity factor that now has an exponential impact on the Assembly Index.. Euler's number to the power of the "assembly index". Here, ^{a_i} is weighted in terms of improbability (e). The use of this exponential function suggests that as the complexity factor increases, the impact on the assembly index grows exponentially, rather than linearly.
    - e^{a_i} is an exponential function in terms of the number-of-steps.
    - e^{a_i} could represent any weighting factor or efficiency coefficient for component *i*.
    - What is the adjusted number of steps (based

on life-likelihoood, or some other factor)?

- $((n_i - 1)/N_T)$ = a scaling factor based on the sequence of the assembly step, with n_i being the sequence number and N_T the total number of steps. This term adjusts the exponential impact based on the sequence of the step within the total process, providing a scaling factor that diminishes the first step and increases towards the last.
  - The expression $((n_i - 1) / N_T)$ measures the concentration (prevalence, ratio) of each component *i*, in the assembly, adjusted by subtracting 1 for normalization purposes.
- n_i = the number of objects of type *i* (copy number; the number of objects that can be found in identical copies).
  - n_i could be the number of component *i* units
  - n_i could be the number of molecules of type, *i.*
  - n_i could be the number of machines of type, *i.*
  - How many copies of the object are there?
  - $(n_i - 1) == 0$, only if there is only one copy of the object/molecule, otherwise it grows linearly with number of copies. It is assumed the object was not assembled. If copy number = 0, then $(0-1)/N_T = 0/N_T = 0$, which drops the entire assembliness of the equation to A = 0.
- N_T = the absolute total number of objects, molecules, steps in the assembly. The total possible sum of all options. Assembly formula is applied to a collection of N_T objects or steps.
  - N_T could represent the total number of all components.
  - N_T could be the total number of components.
  - N_T could be the total number of molecules.
  - N_T could be the total number of machines.
- The "depth" (step count) of a linearly expanding assembly pool has objects that combine at step $a_i \rightarrow a_i + 1$, where an object at the assembly index a_i combines with another object from the assembly pool.
- i = an indexed (counted) variable used in the summation notation. A placeholder that runs from 1 to n (the total number of copies), allowing the formula to sum the square of the proportion a_i for each copy in the total. It is essentially a counter in the formula that iterates over each element in a series.
  - Indexed variable ("i"): This is a variable that changes its value during the summation process. In the formula, it starts at 1 and increases by 1 with each iteration, continuing until it reaches "n," which is the total number of elements (or copies) being considered.
  - Summation notation: The symbol ∑ (sigma) indicates that a sum is being calculated. The variable "i" underneath the sigma tells us where to start counting (usually from 1), and the "n" above it indicates where to stop.

NOTE: *Normalizing by the number of objects in the assembly allows one assembly to be compared between assemblies with different numbers of objects.*

The formula provide for calculating a version of an assembly index "A," which is a sum of terms related to individual assemblies within a system:

1. A: This is the overall Assembly Index ("A" or "AI"). It is a singular value that represents the cumulative measure of assembly complexity for the entire system being analyzed. It takes into account the individual complexities of each assembly within the system and aggregates them into one comprehensive index. The value of A gives the overall complexity of the entire system.
2. a_i: refers to the individual complexity or attribute of each specific assembly within the system, indexed by by *i*. In the summation part of the formula, e^{a_i} would be calculated for each assembly, and a_i could represent a variety of factors such as the complexity, steps, time, or resources required for that specific assembly. The a_i values are specific to each part or step in the process and are not the aggregated measure; rather, they contribute to the overall assembly index A when summed together.

5.1.3 Linear-complexity assembly index[ing]

Here, the assembly index formula can assume a pure linear relationship for linear complexity modeling, where the Assembly Index (A) is calculated as the sum of the products of complexity (C) and time (T) for each step, assuming a linear relationship between complexity, time, and the overall index:

Formula:

$$A = \sum_{i=1}^{N} (C_i \cdot T_i)$$

- Where,
  - A = calculated-complexity [index] of assembly (a.k.a., Asssembly Index, AI).
  - C_i = complexity rating of the i^{th} assembly step, based on predetermined criteria (e.g., technical difficulty, skill-level required).
  - T_i = time required for the i^{th} assembly step.
  - N = final/last assembly step.

The same formula could use sustainability in place of time as a required factor of account and then divide (ratio) the assembly ratings (complexity and sustainability) over the total number of steps:

Formula:

$$A = \frac{\sum_{i=1}^{N} (C_i \cdot S_i)}{T}$$

- Where,
  - A = calculated-complexity [index] of assembly (a.k.a., asssembly index, AI).
  - C_i = complexity rating of the i^{th} assembly step, based on predetermined criteria (e.g., technical difficulty, skill-level required).
  - S_i = sustainability rating of the i^{th} assembly step, reflecting environmental impact and resource efficiency.
    - This could be any variable; it could be time (T_i) required for the i^{th} step.
  - T = total number of steps in the assembly process.
  - N = final/last assembly step.

The complexity rating could be a function of various factors, such as the skill level required, the number of parts, or the precision needed. The time could be actual hours or a relative measure compared to other steps.

> **NOTE:** *The 'complexity of disassembly' and 'ease of complete recycling' variables can also be assessed using similar principles, adapting the formula to reflect disassembly and recycling processes, thus contributing to a full lifecycle analysis of products.*

Here, an electric vehicle may be used as an example assembly. Suppose the assembly of an electric vehicle is broken down into 4 major steps:

1. **Chassis assembly** (including the frame, wheels, and suspension)
   A. Complexity rating (C_1): 3 (on a scale of 1 to 5, where 5 is most complex).
   B. Sustainability rating (S_1): 4 (on a scale of 1 to 5, where 5 is most sustainable).
2. **Battery pack installation.**
   A. Complexity rating (C_2): 5.
   B. Sustainability rating (S_2): 3.
3. **Interior and electronics fitting.**
   A. Complexity rating (C_3): 4
   B. Sustainability rating (S_3): 3.
4. **Powertrain and final inspection.**
   A. Complexity rating (C_4): 4
   B. Sustainability rating (S_4): 4.

Total number of steps in the assembly process (T) = 4.

Applying the assembly index (A) formula:

Applied Formula:

$$A = \frac{(3 \cdot 4) + (5 \cdot 3) + (4 \cdot 3) + (4 \cdot 4)}{4} = 55/4 \quad = 13.74$$

- Where,
  - The assembly index of 13.75 reflects the weighted average of complexity and sustainability ratings across the four major steps of the EV assembly process.
  - A higher complexity rating (C_i) indicates more technical difficulty or higher skill levels required for the assembly step.
  - A higher sustainability rating (S_i) suggests that the step has a lower environmental impact and higher resource efficiency.

5.1.4 Global habitat production assembly complexity index[ing]

A global habitat production can be assembled with a determined complexity using the assembly formula:

1. Inputs:
   A. Habitats ($x_1 \rightarrow x_n$).
      1. Weights (each habitat) ($w_1 \rightarrow w_n$).
2. Summation and bias:

$$A \text{ (weights and habitats)} = \sum_{i=1}^{N} (W_i \cdot X_i) + \text{bias}$$

3. Activation:

$$F(x) = \begin{cases} 1 \text{ if } \sum wx + b \geq 0 \\ 0 \text{ if } \sum wx + b < 0 \end{cases}$$

4. Output result:

$$\hat{y}$$

5.1.5 Societal processes assembly complexity index[ing]

The assembly complexity index aims to quantify the overall efficiency, sustainability, and complexity of production across various stages and resources within society.

Here, the primary groups related to the production process are:

1. Labor-time index (LTi).
2. Labor-complexity index (LCi).
3. Assembly-step index (ASi).
4. Power-usage index (PUi).
5. Resource indices (mineral, cultivated, production

units, operational units).
   A. Recycled resources (RR).
6. Complexity and sustainability ratings for each process.

A simplified assembly complexity formula:

Formula:

$$A = \frac{\sum (\text{Complexity x Sustainability x Efficiency})}{\text{Total Processes}}$$

- Where,
  - **Complexity** is derived from the labor complexity (LCi), labor time (LTi), assembly complexity (a^i), and disassembly complexity (d^i).
  - **Sustainability** factors in the use of recycled resources (RR), labor availability, and energy efficiency.
  - **Efficiency** could encompass labor efficiency in hours (LHrs), resource utilization efficiency (MR, nMR), and power efficiency.

Imagine a scenario where a dwelling construction is under inquiry, incorporating components like sensors (technology), metal frames (mineral resources), and bioplastic casings (non-mineral resources).

1. Calculate individual components:
   A. For labor assume an average complexity of 3 and sustainability of 4 across 1000 LHrs.
   B. For assembly steps, including mineral and technology, assume a complexity of 4, sustainability of 3, and efficiency of 2 across all 10 steps.
   C. Power usage reflects the efficiency of energy consumption, with an assumed efficiency rating of 3 across all processes.

Hence, a simple view of the formula is:

Formula:

$$A = \frac{(3x4x2)_{LTI}+(4x3x2)_{ASI}x10_{steps}+(3)_{PUI}}{\text{Total Processes}}$$

Assuming "Total Processes" includes all steps in labor, assembly, and power usage, 12 total processes (2 labor processes, 10 assembly steps).

Formula:

$$A = \frac{(24)_{LTI}+(240)_{ASI}+(3)_{PUI}}{12} = \frac{267}{12} = 22.25$$

5.1.6 Product complexity assembly index[ing]

The assembly index is a quantitative measure used to assess the ease or complexity of assembling a given product. As the quantitative assessment of the complexity of any product the assembly index (A or AI) accounts for:

1. The number of components.
2. The necessity for specialized tools, techniques or skills.
3. The sequence of assembly steps.
4. The integration of parts into sub-assemblies.
5. The labor time (and compute time) it takes to create the assembly.

A higher Assembly Index typically indicates a more complex assembly process, requiring more time, specialized resources, or both. The assembly index analytical calculations informs efficient product design by quantifying the complexity of its assembly process.

While there is no standard formula for the assembly index (A) due to the variability in products and assembly processes, a hypothetical formula might be:

Formula:

$$A = \frac{n_c + n_t + n_s + n_i + k + n_{steps}}{n_p}$$

- wherein,
  - A = calculated-complexity [index] of assembly (a.k.a., asssembly index, AI).
  - n_c = number-count of components.
  - n_t = number-count of specialized tools required.
  - n_s = number-count of specialized skills required.
  - n_i = number of integration steps into sub-assemblies.
  - n_{steps} = number-count of number of discrete steps necessary to produce an assembly.
  - n_p = number-count of final product units assembled in a standard time period.
  - k = a weighting factor that adjusts the influence of the number of steps on the overall Assembly Index, reflecting the relative complexity added by each additional step in the assembly process. This factor can be calibrated based on empirical data or industry standards to accurately represent the impact of the assembly steps on the complexity of the product.

This formula can be complexified to account for all required variables:

Formula:

Formula:

$$A=\frac{n_c+k1\cdot n_t+K2\cdot n_s+k_3\cdot n_i+k_4\cdot N_{steps}+k_5\cdot n_v+k_6\cdot T_c+k_7\cdot C_{var}+k_8\cdot D_{com}}{n_p}$$

- Where,
  - A = calculated-complexity [index] of assembly (a.k.a., asssembly index, AI).
  - n_c = number-count of components.
  - n_t = number-count of specialized tools required.
  - n_s = number-count of specialized skills required
  - n_i = number of integration steps into sub-assemblies.
  - n_{steps} = number-count of number of discrete steps necessary to produce an assembly
  - n_v = number-count of variants of the product. Different versions of a product can increase assembly complexity due to the need for additional parts and assembly paths.
  - n_p = number-count of final product units assembled in a standard time period.
  - T_c = complexity of technology used in product.
  - C_{var} = variability in component quality or supply. Fluctuations in the quality or supply of components can increase complexity by necessitating additional quality checks or adjustments during assembly.
  - D_{com} = degree of communication required between team members. The need for coordination and communication among team members, especially in large or distributed teams, can add to the complexity of the assembly process. (or this variable could be straight labor hrs).
  - k1,k2,...,k8 = weighting factors for each variable (step).

5.1.7 Concentration assembly index[ing]

The assembly formula can measure the concentration of copies (species) of an assembled unit in a system/environmental (ecological) context. This formula calculates the assembly index by summing the squares of the proportions of each unit (i.e., species) within the whole:

Formula:

$$A = \sum_{i=1}^{N} p_i^2$$

- Where,
  - A is the assembly index.
  - p_i is the proportion of individual units in the belonging to type/category (service, species, need, demand, count, etc.), *i*.
  - N = final/last iteration of the sum.

The following are the primary ways of embodying intentional functional extensions of objects into increasingly useful technology:

1. In chemical systems, molecular assembly treats bonds as the elementary operations from which molecules (micro-physical things) are constructed. Here, atomic bonding is the elementary unit-operation.
2. In electromagnetic systems, electromagnetic assembly treats rotating threads of atoms (separating threads of a rope), (magnetic lines of force), in place, are the elementary unit-operations from which electricity is created.
3. In electromagnetic systems, pumping atoms (torquing a rope) are the elementary unit-operations from light is created.
4. In mechanical (friction) systems, mechanical assembly treats joints and motors as the elementary units/operations from which complex macro-physical things are constructed.
5. In software (computation) systems, computer assembly language treats machine language instruction as the elementary unit-operations from which micro-software things are constructed. Here, computation is the elementary unit-operation.

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Table 17. Decisioning > Decision Table Parts: *The parts of a decision table.*

	Stub (programming)	Entry
Condition / Inquiry	Condition / Inquiry Stub	Condition Entry
Action	Action Stub	Action Entry

Table 18. Decisioning > Decision Table Parts: *The parts of a decision table.*

Decision Table		Requirements (Rules) *Part*		
		Rule 1	**Rule 2**	**Rule 3**
Stub *Part*	**Condition 1**		Condition Entry *Part*	
	Condition 2			
	Action 1		Action Entry *Part*	
	Action 2			

Table 19. Decisioning > Decision Table Parts: *The parts of a decision table.*

Decision table		Requirements *(Rules Part)*		
		Requirement 1	**Requirement 2**	**Requirement 3**
If, Then *(Stub Part)*	**Condition 1** *or* **Inquiry 1**			
	Condition 2 *or* **Inquiry 2**		Entry *Part*	
	Action 1 *or* **Solution 1**			
	Action 2 *or* **Solution 2**			

Table 20. Decisioning > Decision Table Parts: *The parts of a decision table showing the if, then, else statement. The "IF" part are the conditions 1 ... n. The "THEN" part is the actions 1 ... n. Sometimes a decision table will contain an ELSE column at the far right. This is a single decision rule that essentially says that if any of the previous rules in table (to the left of the ELSE column) were not triggered, than take the action(s) specified in the ELSE column. This is a way of simplifying a decision table where only certain condition sets require specialized responses and all other conditions can be responded to with the same action.*

	Rules			
IF	**Decision Rule 1**	**Decision Rule 2**	**Decision Rule 3**	ELSE
Condition 1				
Condition 2		*Entries*		
Condition 3				
THEN				
Action 1				
Action 2		*Entries*		
Action 3				

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Table 21. *This table presents a highly simplified economy in terms of inputs and outputs. In this table, it says that 280,000 kilograms of corn seed plus 1,800,000 liters of fuel were used in the cultivation sector to produce an output of 14,000,000 kilograms. Here, there is a feed-forward relationship. Corn is used to make flour, flour is used to make final food-like substances, which is then consumed. Fuel is used everywhere. Production products are used everywhere. Labor is used everywhere. The final two columns (on the right) show final consumption by users. Labor is not applicable in the final physical consumption. Final physical consumption of fuel is 38,430,000. 638,666 flour for home baking. The value of flour is computed as 0.1.0 = (D3*C10+D6*F10+D7*G10+D8)/D9. This means (corn used * value corn + fuel used * value fuel + produces * value produces + labor)/output of flour. Iterative solving must be used on a spreadsheet to do this since values are recursively defined.*

	Units (measured)	Corn Seed	Flour	Final Food (loaves of corn bread)	Fuel	Produces	Final Physical Consumption	Total Productive Consumption in Physical Terms
Corn Seed	Kilograms	280,000	13,034,000	84,851	0	0	601,149	13,398,851
Flour	Kilograms	0	0	8,485,134	0	50,000	638,666	8,535,134
Final Food (loaves of corn bread)	Loaves	0	0	0	0	0	10,283,982,408	0
Fuel	Kilograms	1,800,000	100,000	800,000	10,600,000	1,270,000	38,430,000	14,570
Produces	Kilograms	204,000	20,000	90,000	200,000	254,000	702,009	768,000
Labor	Person years	467,421	50,000	1,637	544,000	2,570,000	N/A	5,278,421
Output		14,000,000	9,123,800	10,283,982,408	53,000,000	1,470,009		
Value Per Unit	Person years per unit (kg)	0.069	0.109	0.00027	0.023	2.138		

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Table 22. Decisioning > Simple Decision Table: *The left column is the stub portion. The c letter represents conditions (c1,c2,...) and the a letter represents actions (a1,a2,...). The top row is the condition portion; it is the requirements or rules. Each column in the entry portion is a rule (i.e., rule 1, 2, ...). Rules indicate which actions, if any, are taken for the circumstances indicated in the condition portion of the rule. In this example, when conditions c1,c2,c3 are all true, then actions a1 and a2 occur. When conditions c1 and c2 are true, then action a3 occurs. The pattern continues forward in this manner.*

	Entry Portion				
Stub Portion	**Rule 1**	**Rule 2**	**Rule 3**	**Rule 4**	**Rule 5**
Condition 1	T	T	T	F	F
Condition 2	T	T	F	T	F
Condition 3	T	F	T	T	F
Action 1	x	...	x	x	...
Action 2	x	...	...	x	...
Action 3	...	x	...	...	...

Table 23. Decisioning > Simple Decision Table: *The parts of a decision table. This is illustrative of the decision system in this standard.*

	Entry Portion				**Total**
Stub Portion	**Objective 1**	**Objective 2**	**Objective 3**	**Objective 4**	
Inquiry 1	T	T	T	F	3
Inquiry 2	T	T	F	F	2
Inquiry 3	T	F	T	F	2
Solution 1	x	...	...	...	1
Solution 2	...	...	...	...	0
Solution 3	...	...	...	...	0

Table 24. Decisioning > Decision Table Parts: *The parts of a decision table.*

Decision Table	*Entry Portion (Condition Entries; Habitat Service Case Rules)*				
Stub Portion	Rule 1	Rule 2	Rule 3	Rule 4	Rule 5
Conditions					
Condition 1	choice 1a	choice 1b	choice 1a	choice 1b	choice 1b
Condition 2	choice 2a	choice 2b	choice 2a	choice 2a	choice 2b
Outcomes					
Outcome 1	x	...	...	x	...
Outcome 2	...	x	...	...	...

Table 25. Decisioning > Decision Table Parts: *The parts of a decision table.*

Objects	Conditions			Decision
	Distance	Capacity	Requirements	Acceptance
S1	short	yes	low	yes
S2	shortest	yes	high	yes
S3	long	no	high	yes
S4	shortest	no	low	no
S5	longest	yes	low	no
S6	short	no	high	no

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Table 26. Decisioning > Decision Table: *A decision table showing the conditions (value alignment objectives), service systems, and service system solutions. The entries are fictitious.*

Conditions ⇩ / Solutions ⇨		Habitat Service Solutions									
		Life Support Service				Technology Support Service				Exploratory Service	
		Solution 1	Solution 2	...	Solution n	Solution 1	Solution 2	...	Solution n	Solution 1	Solution n
Value Alignment Planning	Justice Inquiry	T	T	...	F	F	F	...	F	T	F
	Social Inquiry	F	T	...	T	T	F	...	F	T	T
	...	...	...	...	...	...	...	...	...	...	...
	Inquiry n	F	F	...	T	T	T	...	F	T	F
Economic Sector Calculation Planning Matrix	Life Support Resources	3	4	...	3	1	1	...	1	5	9
	Technology Support Resources	1	2	...	4	1	1	...	1	2	8
	Exploratory Resources	5	5	...	9	5	7	...	4	8	8
Contribution		3	5	...	5	4	3	...	1	1	5
Priority (Urgency Spectrum) Determination		1	1	...	1	5	5	...	5	8	8
Total Solution Inputs		∑	∑	...	∑	∑	∑	...	∑	∑	∑
Actions											
Action 1 (Accept)		x	-	...	x	-	x	...	x	-	x
Action 2 (Reject)		-	x	...	-	x	-	...	-	x	-

Table 27. Decisioning > Decision Table: *A decision table showing the conditions (design acceptability protocol), the acceptable actions (reject or accept), and a series of solution options from solution Case 1A to 3A. In this example, only 1 solution is acceptable, 2A. Only one solution passes all the inquiries:*

DECISION TABLE Solution Options ⇨ Design Acceptability Protocol ⇩		Technical Solution Inquiry					
		Solution Case 1A	Solution Case 1B	Solution Case 2A	Solution Case 2B	Solution Case 2C	Solution Case 3A
Parallel Value Alignment Inquiry	Justice Inquiry	T	T	T	T	F	T
	Resource Inquiry	F	T	T	T	T	T
	Environmental Inquiry	F	T	T	T	F	T
	Efficiency Inquiry	T	F	T	T	T	F
	Preference Inquiry	F	F	T	T	T	T
	Effectiveness Inquiry	T	T	T	F	T	T
Actions							
Action 1 (Accept Solution)		-	-	X	-	-	-
Action 2 (Reject Solution)		X	X	-	X	X	X

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Table 29. Decisioning > Decision Table: *An example decision table with the conditions (inquiries) as rows and the potential solutions as columns. The inquires are conducted on each solution, and the solution is scored.*

DECISION TABLE		Design Options (Solutions)						
		Design Option 1		Design Option 2		...	Design Option *n*	
Priority		Weight	Score	Weight	Score	...	Weight	Score
Decision Inquiry Processes	Inquiry 1	#	#	#	#	...	#	#
	Inquiry 2	#	#	#	#	...	#	#
	...	...	...	..	...	...	...	...
	Inquiry *n*	#	#	#	#	...	#	#
Total		#	#	#	#	...	#	#

Table 28. Decisioning > Decision Table: *An example decision table with the value alignment objective criteria to the left and the solution scores on the right.*

Criterion type *(eliminatory or ranking only)*	Criterion *(objective)*	Criterion Weight	Threshold *(accept, go OR not accept, no go)*	Solution Scores		
				Score for solution 1	Score for solution 2	Score for solution 3
Eliminatory	Effectiveness	2	3	2	4	2
Ranking only	Justice	2	5	6	2	1
...	...	...	...	...	...	...
Ranking only	Social	4	2	3	5	7
Ranking only	Power usage	2	*Does not apply*	1	3	6
Ranking only	Availability	3	7	3	9	2
Ranking only	Manufacturability	3	5	2	4	1

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Table 30. Decision System > Resource-Based > MacroCalculation*: The resource-based logical design calculation table.*

Logical Symbol	Description
E_{design}	Design efficiency
E_p	Production efficiency (Optimized production efficiency)
E_{dist}	Distribution efficiency (Optimized distribution efficiency; $\mathbf{d}_p$)
E_r	REcycling efficiency (Optimized recycling efficiency; P_{reg})
E	Efficiency
$\mathbf{f}_p$	Production functional
$\mathbf{E}^i_{design}$	[Current] Design efficiency standards
$\mathbf{t}_d$	Durability
A_{design}	Adaptability (design of)
$\mathbf{c}_r$	Recycling conduciveness of components
$\mathbf{g}^1_c, \mathbf{g}^2_c, \ldots, \mathbf{g}^i_c, \ldots, \mathbf{g}^{Nc}_c$	Genre components (total number)
Nc	Minimum number of genre components
$\mathbf{H}_L$	Human Labor
$\mathbf{A}_L$	Automated Labor
$\mathbf{f}_{design}$	Functional design efficiency
D	Demand class determination process
$\mathbf{D}_s$	Demand splitting value
$\mathbf{D}_c$	Consumer demand (or, $\mathbf{D}_u$ for user demand)
$\tilde{\mathbf{A}}_p$	Flexible automation process
$\bar{\mathbf{A}}_p$	Fixed automation process
$\mathbf{C}_i$	User with index i (or, $\mathbf{U}_i$ for user with index i)
$\mathbf{D}_i$	Distributor with index i
$\mathbf{d}_p$	Distance to production facilities (proximity protocol/strategy)
$\mathbf{d}_{dist}$	Distance to re-distribution facilities
$\mathbf{P}_{reg}$	Regenerative protocol
$\mathbf{DIST}_d$	Direct to user distribution
$\mathbf{DIST}_m$	Mass user distribution

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Table 32. Decision System > Resource-Based > MacroCalculation*: The calculation table for optimal labor-automation.*

Logical Symbol	Description
$H_L / (H_L + A_L) \rightarrow min$	Human effort (labor) is reduced to its desired design minimum
$H_L (I_1 ,..., I_i) / A_L (I_1 ,..., I_i) \rightarrow min$	This is the expression in its expanded form.
I_i	Individual with index i

Table 31. Decision System > Resource-Based > MacroCalculation*: The calculation table for optimal durability.*

Logical Symbol	Description
t_d	Durability maximization
$t_d (d_1 , d_2 ,..., d_i)$	Durability maximization expanded
d_i	Durability factors
$d^0_1 , d^0_2 ,..., d^0_i$	Optimal and coordinated values of the factors
$t_d (d_1 , d_2 ,..., d_i) \rightarrow max, t_d = t_{max} (d^0_1 , d^0_2 ,..., d^0_i)$	Optimized durability

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Table 33. Decision System > Economic Calculation Planning > Quadrant View: *A complex input-output flow table showing its basic four quadrant view (square n*n) of inputs and outputs for high-level visual comprehension of statistical operations to be completed on accountable quantities in order to produce economic calculation results useful for decisioning purposes.*

Sectors		**Inputs**		**Total Outputs**
Sectors				=
Outputs		**Quadrant 1** *Elements of intermediate demand* n•n matrix (a.k.a., nxn matrix)	**Quadrant 2** *Elements of final demand* n•m matrix (a.k.a., nxm matrix)	Quantity
		Quadrant 1 *Primary inputs to the production sector* p•n matrix (a.k.a., pxn matrix)	**Quadrant 4** *Primary inputs to the final demand* p•m matrix (a.k.a., pxm matrix)	Quantity
Total inputs	=	Quantity	Quantity	Result

Table 35. Decision System > Economic Calculation Planning > Simple Input-Output Table:
A simple economic input-output table example.

	Purchasing Industry	Goes into				*Human Demand*
Selling Industry	*Sectors of simple economy*	Coal	Electricity	Water	Product *n*	**Total Output**
Comes out of	Coal	...	...	...	...	...
	Electricity	...	...	...	...	...
	Water	...	...	...	...	...
	Product *n*	...	...	...	...	...
Natural Resources	**Total Used/ Produced**	...	...	...	...	...

Table 36. Decision System > Economic Calculation Planning > Resource and Sector View: *The generalized case of an input-output matrix; wherein, x_i are resources or products, y_i is a sector of the economy (e.g., habitat service system), $\sum_i x_i$ is the total output produced in sector i, $\sum_i y_i$ are the total amount of resource x_i used in production across sectors.*

Resource flow to services inward ⇨ Resource flow to services outward ⇩		Resources *(and their resource compositions into 'products')*			
		x_1	...	x_n	$\sum_i x_i$
Sectors of the economy (and their aggregation into 'services systems')	y_1	...	...	...	...
	...	...	...	...	...
	y_n	...	...	...	...
	$\sum_i y_i$	...	...	...	...

Table 34. Decision System > Economic calculation Planning > Balancing: *Input-output table planning necessarily involves material balance planning of rows as well as column balance planning.*

Vector	Input-Output Table Planning *(balance rows and columns together)*	
Output (out from)	⇨	Row Balancing (*is* "material balance planning")
Input (in to)	⇩	Column Balancing

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Table 37. Decision System > Economic Calculation Planning > Service System Input-Output View: *Basic structure of an economic input-output table for [habitat] service systems.*

Inputs (Requirements) ⇨ / Outputs (Productions) ⇩		Habitat Service System Use				Final Human Use	
		Service System 1	Service System 2	...	Service System n	Total (Net) Economic Outputs *(demand)*	User Access *(type of, time of)*
Intermediate Habitat Service Systems	Service System 1	$Z^{L}_{1,1}$	$Z^{L}_{1,2}$	...	$Z^{L}_{1,n}$	d^{L}_{1}	a^{TYPE}_{TIME}
	Service System 2	$Z^{L}_{2,1}$	$Z^{L}_{2,2}$	...	$Z^{L}_{2,n}$	d^{L}_{2}	a^{TYPE}_{TIME}
	...	...	...	...	...	..	..
	Service System n	$Z^{L}_{n,1}$	$Z^{L}_{n,2}$	...	$Z^{L}_{n,n}$	d^{L}_{n}	a^{TYPE}_{TIME}
Total (Net) Economic Input	All Service Systems	w_1	w_2	...	w_n		

Table 38. Decision System > Economic Calculation Planning > Technical Interdependence: *Input-output table shows the technical interdependence between service systems in a given environment.*

Demand side (Inputs) ⇨ / Production side (Outputs) ⇩		index j (inputs; intermediary demand)				Final Use (Final Demand)	
		Service System 1	Service System 2	...	Service System n	+ User Final Demand (d, or sometimes, D or Y)	= Total Output (x)
index i (outputs)	Service System 1	$Z^{L}_{1,1}$	$Z^{L}_{1,2}$	...	$Z^{L}_{1,n}$	d^{L}_{1}	L_1
	Service System 2	$Z^{L}_{2,1}$	$Z^{L}_{2,2}$	...	$Z^{L}_{2,n}$	d^{L}_{2}	L_2
	...	...	...	...	...	...	...
	Service System n	$Z^{L}_{n,1}$	$Z^{L}_{n,2}$	...	$Z^{L}_{n,n}$	d^{L}_{n}	L_n
+ Priority Spectrum (priority added, or "value" added)		u_1	u_2	...	u_n	u_d	u
= Total Output Schedule		L_1	L_2	...	L_n	d	L
Key: Z = Intermediate Demand							

Table 39. Decision System > Economic Calculation Planning > Service System Input-Output View: *Basic structure of an economic input-output table for access by users to the service and object (goods) outputs of habitat service system sectors immediate and intermediate services and technologies (productions).*

Inputs (Requirements) ⇨ / Outputs (Supplies) ⇩		Habitat Service Sectors				Final Use (Final Demand Complete)	
		Service System 1	Service System 2	...	Service System n	Total (Net) Access quantity	User Access (type of, time of)
Habitat Service Sectors	Service System 1	$Z^{L}_{1,1}$	$Z^{L}_{1,2}$	...	$Z^{L}_{1,n}$	a^{L}_{1}	a^{TYPE}_{TIME}
	Service System 2	$Z^{L}_{2,1}$	$Z^{L}_{2,2}$	...	$Z^{L}_{2,n}$	a^{L}_{2}	a^{TYPE}_{TIME}
	...	...	...	...	...	..	..
	Service System n	$Z^{L}_{n,1}$	$Z^{L}_{n,2}$	...	$Z^{L}_{n,n}$	a^{L}_{n}	a^{TYPE}_{TIME}
Total Requirements		R_1	R_2	...	R_n	R_n	

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Table 40. Decision System > Economic Calculation Planning > Material Cycling: *Material cycling input-output economic table.*

Sectors of [Resource] Materialization		Inputs				
		Extraction Service	Cultivation Service	Production Service	Library Access Service	Recycling Service
Outputs	Extraction Service	X11	X12	X13	X14	X15
		X1	X2	X3	X4	X5
	Cultivation Service	X21	X22	X23	X24	X25
		X1	X2	X3	X4	X5
	Production Service	X31	X32	X33	X34	X35
		X1	X2	X3	X4	X5
	Library Access Service	X41	X42	X43	X44	X45
		X1	X2	X3	X4	X5
	Recycling Service	X51	X52	X53	X54	X55
		X1	X2	X3	X4	X5
Life Cycle Stages		Raw Materials >>	Raw Materials >>	Production & Transportation >>	Use >>	Disposal/Recycle >>

Table 41. Decision System > Economic Calculation Planning > Environmental Economics: *Environmental economics (a.k.a., eco-habitat economics). Material resources flow are measured along the rows. Activities are measured in the columns.*

Sectors of BioSphere		Activities (Task-Deliverables)	
		Habitat Service Systems *(Human)*	**Ecological Processes** *(Non-Human)*
Materials (Resources)	**Habitat Service Systems** *(Human)*	Flows between Habitat Service Systems (material flows, A_{xx})	Flows from the Habitat Service System to the Ecosystem (material flows, A_{xe})
	Ecological Processes *(Non-Human)*	Flows from the Ecosystem to the Habitat Service System (material flows, A_{ex})	Flows within the Ecosystem (material flows, A_{ee})

Table 42. Decision System > Economic Calculation Planning > Input-output: *Input-output economics base square table.*

		Demands *(users have requirements)*
		Input Product *(resource composition)*
Services *(have requirements to produce products)*	**Output Product** *(resource composition)*	*Accounting and Calculation occurs here*

Table 43. Decision System > Economic Calculation Planning > Decisioning > Simplified Input-Output Economic Table: *A simplified input-output table for a habitat-based economic system where habitat sectors are prioritized and patterns of demands are processed as intermediary requirements for resources to produce (as sectors) services and objects for the optimal and mutual fulfillment of all users by means of computation therein.*

Sectors of Habitat Economy	Processing	Final Demand	Total Outputs
Processing	InterHabitat / InterSystem Structure	Usage Patterns	
Total Inputs		Optimal Path Calculation	

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Table 46. Decision System > Economic Calculation Planning > Leontief Open and Closed: *This is an example of a Leontief closed table and open table.*

The Open and Closed Leontief models		OPEN MODEL							
		CLOSED MODEL							
		Sector 1	Sector 2	...	Sector n	User Access (User Demand)	Taxes (Government Demand)	...	Demand n
CLOSED MODEL	Sector 1								
	Sector 2	**CLOSED MODEL -** When all outputs go to all inputs				**OPEN MODEL -** When some outputs go to "external" demands (e.g., user access, taxes, etc.)			
	...								
	Sector n								

Table 44. Decision System > Economic Calculation Planning > Accounting: *Simplified resource and process accounting table.*

To (Output) ⇨ From (Input) ⇩		Processes	User demand	Current Production
		1 ... *n*	**Final demand**	**Total Production**
Projects	**Process 1** ... **Process *n***	Endogenous transaction matrix Z(*n* x *n*)	f (*n* x 1)	x (*n* x 1)
	Resource 1 ... **Resource *m***	Exogenous transaction matrix R(*m* x *n*)		

Table 47. Decision System > Economic Calculation Planning > Simplified Matrix Model: *The following is a highly simplified example of a economic matrix (input-output) model.*

	Types of (sectors) of production	End product	Sum of output
Types of (sectors) of production	**Quadrant 1** $x_{11}x_{12}...x_{1n}$ $x_{21}x_{22}...x_{2n}$ ... $x_{n1}x_{n2}...x_{nn}$	**Quadrant 2** d_1 d_2 ... d_3	x_1 x_2 ... x_3
Input of primary resources	**Quadrant 3** $z_1z_2...z_n$	**Quadrant 4**	
Sum of inputs	$x'_1x'_2...x'_n$		

Table 45. Decision System > Economic Calculation Planning > Simplified Economic Plan: *The following is a highly simplified example of a simplified closed and planned economy, where distribution occurs from coal, electric, and steel, and is entirely used by coal, electric, and steel.*

Production of Coal	*Production of* Electric	*Production of* Steel	Used completely by:
0	**.4**	**.6**	**Coal**
.6	**.1**	**.2**	**Electric**
.4	**.5**	**.2**	**Steel**

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Table 48. Decision System > Economic Calculation Planning > Data Flow: *An economic system can be viewed as a table of data about access to need fulfillment based upon units of some operation.*

Gather all available data	Divide into categories	Divide categories into sub-categories	For selected areas supplement with data in physical units	Count quantity of resources	Calculate based on IO analysis and hybrid processes	Service Platform Resource Compositions and Allocations
DATA	NEEDS	DEMANDS	UNITS	RESOURCES	OPERATIONS	Access
Unified Societal Information System	**Life Support Service** System	Architectural service	metric	#	...	...
	Life Support Service System	Water service	metric	#	...	...
	Life Support Service System	Cultivation Service	metric	#	...	...
	Life Support Service System	Power Service	metric	#	...	...
	Life Support Service System	Medical Service	metric	#	...	...
	Technology Support Service System	Information Service *(Storage and Processing)*	metric	#	...	...
	Technology Support Service System	Communications Service *(Devices and Protocols)*	metric	#	...	...
	Technology Support Service System	Transportation Service *(Machines and Protocols)*	metric	#	...	...
	Technology Support Service System	Materialization Service *(Machines and Protocols)*	metric	#	...	...
	Exploratory Support Service System	Scientific Discovery Service	metric	#	...	...
	Exploratory Support Service System	Technology Development Service	metric	#	...	...
	Exploratory Support Service System	Learning Service	metric	#	...	...
	Exploratory Support Service System	Recreation Service	metric	#	...	...
	Exploratory Support Service System	Art & Music Service	metric	#	...	...
	Exploratory Support Service System	Consciousness Service	metric	#	...	...

Table 49. Decision System > Economic Calculation Planning > Natural User Economics: *An input-output table showing natural resources and demand within a community-type society where access is split three-ways: between intersystem teams (contributors who sustain and adapt the society); common [city] access (the city/habitat service commons); and, personal access.*

Resource Access Sectors		Contributor Activity Demands	Final User Activity Demands	
		InterSystem Team Access	**Common [City] Access**	**Personal Access**
Natural Resources	**Pre-existing motion (energy)**	Intermediary products (in order to do work, energy is needed)	Habitat service subsystem material interfaces	Habitat service subsystem objects
	Materials (organic and inorganic resources)	Intermediary products (in order for teams to do work, resources are needed)	Habitat service subsystem material interfaces	Habitat service subsystem objects
	Human contribution (capable and accountable individuals)	Intermediary products (in order to contribute, teams need intermediate products to do their work)	**Collaborative design system interface**	**Personal data and information processing interface**

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Table 50. Decision System > Economic Calculation Planning > Simple Input-Output Habitat Access and Allocation Table: *This is a simplified input-output table example of access and allocation within a habitat service system with priority designation and final community demand. The sectors of the economy are those fundamental to a habitat service system. The economy can be summarized by taking the last column: $X = x_1 + x_2 + x_3 + L_1 + L_2 + L_3$; or, taking the last row: $X = x_1 + x_2 + x_3 + dc + dp$*

Wherein,

- z_{ij} is the input of sector i to j
- d_i is the user component of final demand for output of sector i
- L_{ij} is the prioritization component of final demand for output of sector i
- x_i is the total output of sector i
- Lj is the priority input for sector j
- X is the total output for the entire economy

Combining the equations:

$$x_1 + x_2 + x_3 + L_i = x_1 + x_2 + x_3 + d_i$$
$$X_i + L_i = X_i + d_i$$
$$L_i = d_i$$

The left-hand side of the equation represents the [gross economic] priority row for all sectors, while the right-hand side represents demand for object/service production. Through a unified information system, it is possible to equate the total production, with the total demand, with total resources, with a human habitat prioritized operating structure, without price. Input-output analysis is the basis for this type of economic calculation (which generally uses linear algebra, but may in the future use neural networks).

		Intermediary Processes and Objects Input (j)				**Output of services and service objects to community**		
	Goes to ⇨	**Consuming Sectors** *(InterSystem Team Access; Habitat Service)*				**Final Demand; User Access (Community + Personal = Total Demand; d_i)**		**Total production output for demand (x_i)**
Comes from ⇩	[Processing] Sectors of Economy	**Life (S_1)**	**Tech (S_2)**	**Exp (S_3)**	**... S*n***	**Community (dc_i)**	**Personal (dp_i)**	
Producing Sectors (i) *(Intersystem Team Access; Habitat Service)*	**Life (S_1)**	Z_{11}	Z_{12}	Z_{13}	...	dc_1	dp_1	x_1
	Tech (S_2)	Z_{21}	Z_{22}	Z_{23}	...	dc_2	dp_2	x_2
	Exp (S_3)	Z_{31}	Z_{32}	Z_{33}	...	dc_3	dp_3	x_3
	... S*n*	...	...	...	...	...	...	...
Priority Added (L_i)	**Incident (L_1)**	L_{11}	L_{12}	L_{13}	...	L_{1dc}	L_{1dp}	L_1
	Operations (L_2)	L_{21}	L_{22}	L_{23}	...	L_{2dc}	L_{2dp}	L_2
	Planning (L_3)	L_{31}	L_{32}	L_{33}	...	L_{3dc}	L_{3dp}	L_3
Total inputs (x_j)		x_1	x_2	x_3	...	**dc**	**dp**	X

Table 51. Decision System > Economic Calculation Planning > Simplified Matrix Model: *The following is a highly simplified example of a economic matrix (input-output) model.*

From \ To	Solution 1 ... n	Final Demand	Total Production
Process 1 ... Process n	**Endogenous transaction matrix Z(n x n)**	**d(n x 1)**	x(n x 1)
Resource (R) 1 ... m	**Exogenous flow matrix R(m x n)**		
Contribution (C) 1 ... c	**Exogenous flow matrix C(m x c)**		
Objectives (O) 1 ... o	**Exogenous flow matrix O(m x o)**		
Sum of inputs	$x'_1 x'_2 ... x'_n$		

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Table 54. Decision System > Economic Calculation Planning > Simplified Matrix Model: *The following is a highly simplified example of a economic matrix (input-output) model.*

Habitat Process	Input	Operational Control Parameters	Output
User Demand	Survey	Arrival time, production process capability, product list	Compiled demand list
Logistics & Planning	Compiled demand list, technology matrix, priority matrix, resource list	List of materials, operational parameters	Schedule

Table 52. Decision System > Inquiry > Economic Calculation Planning > Decisioning > Impact-Probability: *Example of a qualitative matrix, a risk matrix. All qualitative matrices also have quantitative components (see: 1, 2, 3, 4), which are necessary for performing statistical/mathematical operations on the matrix in order to derive more useful data. Qualitative matrices exist in contrast to quantitative matrices, such as Leontif input-output matrices.*

Probability (consequence category)	Very Likely	**Acceptable Risk (2; Medium)**	**Unacceptable Risk (3; High)**	**Unacceptable Risk (4; Critical)**
	Likely	**Acceptable Risk (1; Low)**	**Acceptable Risk (2; Medium)**	**Unacceptable Risk (3; High)**
	Unlikely	**Acceptable Risk (1; Low)**	**Acceptable Risk (1; Low)**	**Acceptable Risk (2; Medium)**
	Occurrence/ Impact	Low	Moderate	High
Probability x Impact = Risk	**Impact** (How serious is the risk?)			

Table 53. Decision System > Economic Calculation Planning > Decisioning > Human-Habitat Priority: *The following is a highly simplified example of service sector priority in an real-world habitat economy where humans. Here, a lower priority value is of a higher importance to human need fulfillment.*

Prioritizable Sectors of Habitat Economy	Life	Technology	Exploratory	Total natural units
Life	**1**	**1**	**1**	**3**
Technology	**1**	**2**	**2**	**5**
Exploratory	**1**	**2**	**3**	**6**
Final Priority	**3**	**5**	**6**	**14**

Table 55. Decision System > Economic Calculation Planning > Material Cycling: *Material cycling input-output economic table. All inputs are consumed by all outputs. It is possible to think of individuals (subjects, agents, users, etc.).*

Sectors of Habitat		Inputs (j)			Total Output
		Habitat Service 1	**Habitat Service 2**	**Habitat Service 3**	
Outputs (i)	**Habitat Service 1**	X11	X12	X13	X1 j
	Habitat Service 2	X21	X22	X23	X2 j
	Habitat Service 3	X31	X32	X33	X3 j
Total Used *(of primary inputs; total primary inputs)*		∑ i	∑ i	∑ i	X X ∑ ∑ i j

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Table 56. **Decision System > Economic Calculation Planning > Service System Input-Output Access Planning Matrix:** *This is an access matrix for a unified habitat service system where there are three primary (economic) habitat service systems (sectors) and three forms of access to the inputs and outputs of those service systems. Basic summations for an input-output table for [habitat] service economic systems. $Z_{i,j}$ represents the quantity of some unit or value in each sector. The first three rows represent sectors dedicated to production of habitat services. The fourth row is a sum total of the rows above. The columns indicate the requirement for (i.e., value of/ demand for) the service sectors. The final right column is the total outputs of all sectors, and its total sum. Wherein, pers. (is personal access), com. (is common access), and tea. (is team access).*

Access Matrix: Access to the Inputs and Outputs of Sectors of a Habitat Service System			Inputs (j)									Total Output
			Habitat Service 1 (Life; Z1)			**Habitat Service 2 (Technology; Z2)**			**Habitat Service 3 (Exploratory; Z3)**			
			pers.	com.	tea.	pers.	com.	tea.	pers.	com.	tea.	
Outputs (i)	**Habitat Service 1 (Life; Z1)**	pers.	Z_{11}			Z_{12}			Z_{13}			Z_1
		com.										j
		tea.										
	Habitat Service 2 (Technology; Z2)	pers.	Z_{21}			Z_{22}			Z_{23}			Z_2
		com.										j
		tea.										
	Habitat Service 3 (Exploratory; Z3)	pers.	Z_{31}			Z_{32}			Z_{33}			Z_3
		com.										j
		tea.										
Total Used *(of primary inputs; total primary inputs)*												Z Z
			∑			∑			∑			∑ ∑
			i			i			i			i j

Table 57. **Decision System > Economic Calculation Planning > Simple Input-Output Table:** *Another simple economic input-output table example.*

		Inputs of Sectors				**Outputs to Final Using Humans**			
		Processing (InterSystem Team Access)				**Final Access (Community + Personal = Total Demand; d_i)**		**Total supply (s_i)**	**Total production for demand (x_i)**
	Sectors of economy	**A**	**B**	**C**	**...** *n*	**Community (dc_i)**	**Personal (dp_i)**		
Outputs of Sectors	**A**	...	...	...	...	...	...	...	...
	B	...	...	...	...	...	...	...	...
	C	...	...	...	...	...	...	...	...
	... *n*	...	...	...	...	...	...	...	...
Total Priority / Value Added		...	...	...	...	...	...	...	...
Total Used (x_i)		...	...	...	...	...	...	...	...

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Table 58. Decision System > Economic Calculation Planning > input-output table: *Simplified version of an economic input-output table showing resources moving into and out of sectors for a value oriented final demand.*

		Using Sectors						**Total Outputs (x_i)**
	Goes to ⇨	**Consuming Sectors** *(InterSystem Team Access; Habitat Service)*				**User Access**		
Comes from ⇩	[Processing] Sectors of Economy	**A**	**B**	**C**	**...** *n*	**Community (dc_i)**	**Personal (dp_i)**	
Producing Sectors (i) *(Intersystem Team Access; Habitat Service)*	**A**	z_{11}	z_{12}	z_{13}	...	dc_1	dp_1	x_1
	B	z_{21}	z_{22}	z_{23}	...	dc_2	dp_2	x_2
	C	z_{31}	z_{32}	z_{33}	...	dc_3	dp_3	x_3
	... *n*	...	...	...	...	...	...	...
	Contribution	C_{11}	C_{11}	C_{11}	...	C_{1dc}	C_{1dp}	
Value/s Added (L_i)	**Priority Added**	L_{11}	L_{12}	L_{13}	...	L_{1dc}	L_{1dp}	L_1
	Other Values Added (Objectives, Urgency)	L_{21}	L_{22}	L_{23}	...	L_{2dc}	L_{2dp}	L_2
Total inputs (x_i)		x_1	x_2	x_3	...	**dc**	**dp**	X

Table 59. Decision System > Economic Calculation Planning > Service System Input-Output View: *Basic summations for an input-output table for [habitat] service economic systems.* $z_{i,j}$ *represents the quantity of some unit or value in each sector. The first three rows represent sectors dedicated to production of habitat services. The fourth row is a sum total of the rows above. The columns indicate the requirement for (i.e., value of/demand for) the service sectors. The final right column is the total outputs of all sectors, and its total sum.*

Intermediary and Complete Matrix Z (Z or) *Inputs (Requirements) ⇨* *Outputs (Productions) ⇩*		Habitat Service System Use (j)							
		Service System 1	Service System 2	...	j	...	Service System n	Total Output to all Service Systems (-1)	Demand
Intermediate Habitat Service Systems (i)	Service System 1	$Z^L_{1,1}$	$Z^L_{1,2}$	...	$Z^L_{1,j}$	...	$Z^L_{1,n}$	$\sum_{j-1} z_{1,j}$	d_1
	Service System 2	$Z^L_{2,1}$	$Z^L_{2,2}$	...	$Z^L_{2,j}$	...	$Z^L_{2,n}$	$\sum_{j-1} z_{2,j}$	d_2
	...	...	...	...	...	...	...	...	
	i	$Z^L_{i,1}$	$Z^L_{i,2}$	...	$Z^L_{i,j}$	...	$Z^L_{i,n}$	$\sum_{j-1} z_{i,j}$	d_i
	...	...	...	...	...	...	...	...	
	Service System n	$Z^L_{n,1}$	$Z^L_{n,2}$	...	$Z^L_{n,j}$	...	$Z^L_{n,n}$	$\sum_{j-1} z_{n,j}$	d_n
Total (Net) Economic Input	Total used for all Service Systems (-1)	$\sum_{i-1}^{n} z_{i,1}$	$\sum_{i-1}^{n} z_{i,2}$	...	$\sum_{i-1}^{n} z_{i,j}$	...	$\sum_{i-1}^{n} z_{i,n}$	$\sum_{i-1}^{n} \sum_{j-1}^{n} z_{i,j}$	$\sum_{i-1}^{n} y_j$
Objectives	Variable Value Added (decisioning result)	V_1	V_2		V_j		V_n	$\sum_{j-1}^{n} V_j$	

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Table 60. Decision System > Economic Calculation Planning > Products and Sectors Matrix: *This is an example of a product and sector matrix.*

Products and Sectors (Objects and Services)		Inputs								Final Access Demand (Final Demands)	
Uses (To) ⇨		Products				Sectors				Final Use	
Resources (From) ⇩	HABITAT SERVICES & OBJECTS	Product 1	Product 2	...	Product n	Sector 1	Sector 2	...	Sector n	Common Access	Personal Access
Product Outputs	Product 1										
	Product 2	Output of products as input of products (output of objects as input of other objects)				Output of products as input of sectors (output of objects as input of services)				Objects used by the population	
	...										
	Product n										
Sector Outputs	Sector 1										
	Sector 2	Output of sectors as input of products (output of services as input of objects)				Output of sectors as input of other sectors (output of services as input of other services)				Services used by the population	
	...										
	Sector n										
Priority (Urgency Spectrum) Determination											
Total Inputs											

Table 61. Decision System > Economic Calculation Planning > Service Object Sector Access: *Table showing two sectors (Life and Tech) and final user demand for service-objects.*

Service and Object Access		(InterSystem) Team Access								Final Access (Final Demands)	
Inputs (To) ⇨		Habitat Service Sector 1 (Life)				Habitat Service Sector 2 (Tech)				Final Use	
Outputs (From) ⇩	HABITAT SERVICES & OBJECTS	Service 1	Service 2	...	Service n	Service 1	Service 2	...	Service n	Common Access	Personal Access
Sector 1 (Life)	Service 1	Service	Service	...	Service	Service	Service	...	Service	Service	Service
		Object	Object	...	Object	Object	Object	...	Object	Object	Object
	...	...	...	...	...	...	...	...	...	...	...
	Service n	Service	Service	..	Service	Service	Service	...	Service	Service	Service
		Object	Object	...	Object	Object	Object	...	Object	Object	Object
Sector 2 (Tech)	Service 1	Service	Service	...	Service	Service	Service	...	Service	Service	Service
		Object	Object	...	Object	Object	Object	...	Object	Object	Object
	...	...	...	...	...	...	...	...	...	...	...
	Service n	Service	Service	...	Service	Service	Service	...	Service	Service	Service
		Object	Object	...	Object	Object	Object	...	Object	Object	Object
Priority (Urgency Spectrum) Determination											
Total Inputs											

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Table 63. Decision System > Economic Calculation Planning > Decisioning > Matrix Operations: *Simplified view of the operation, input, and outcome of the three functions of addition (and subtraction), scalar multiplication, and matrix product.*

Operation		Input		Outcome	
Function	**Expression**	**Input 1**	**Input 2**	**Size**	c_{ij} **from**
Add / Subtraction	**C = A ± B**	$(a_{ij})_{m \times n}$	$(b_{ij})_{m \times n}$	$(c_{ij})_{m \times n}$	a_{ij}, b_{ij}
Scalar Multiplication	**C = kA**	**k**	$(a_{ij})_{m \times n}$	$(c_{ij})_{m \times n}$	k, a_{ij},
Matrix Product	**C = AB**	$(a_{ij})_{m \times p}$	$(b_{ij})_{p \times n}$	$(c_{ij})_{m \times n}$	i^{th} row of A j^{th} column of B

Table 62. Decision System > Economic Calculation Planning > Decisioning > Matrix Operations: *Two matrices are shown, W and W' (a.k.a., W prime). W' is the inverse of W. The identity matrix is shown in quadrant 2 of matrix W and Quadrant 3 of matrix W'.*

		Service 1	Service 2	...	Service n	Object 1	Object 2	...	Object n	
Matrix W =	Service 1	0	0	0	0	1	0	0	0	Identity matrix (I)
	Service 2	0	0	0	0	0	1	0	0	
	...	0	0	0	0	0	0	1	0	
	Service n	0	0	0	0	0	0	0	1	
	Object 1	0	1	1	0	0	0	0	0	
	Object 2	1	1	1	1	0	0	0	0	
	...	1	0	0	1	0	0	0	0	
	Object n	0	0	0	1	0	0	0	0	
		Production (p)								

		Service 1	Service 2	...	Service n	Object 1	Object 2	...	Object n	
Matrix W' =	Service 1	0	0	0	0	0	1	1	0	Production prime (p')
	Service 2	0	0	0	0	1	1	1	1	
	...	0	0	0	0	1	0	0	1	
	Service n	0	0	0	0	0	0	0	1	
	Object 1	1	0	0	0	0	0	0	0	
	Object 2	0	1	0	0	0	0	0	0	
	...	0	0	1	0	0	0	0	0	
	Object n	0	0	0	1	0	0	0	0	
		Identity matrix (I)								

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Table 64. Decision System > Economic Calculation Planning > Habitat Service Flows: *Simplified input-output table of a community-type habitat service system for human life, technical, and exploratory fulfillment. The economic sectors are: Life, Technology, and Exploratory. The primary sub-system services are shown for each of the top-level economic sectors for a community-type society.*

Total top-level sectors and services for a habitat service system		Ecological Processes	Inputs															
			Life Support Service System	*Life Support Service System*	*Life Support Service System*	*Life Support Service System*	*Life Support Service System*	*Life Support Service System*	*Technology Support Service System*	*Technology Support Service System*	*Technology Support Service System*	*Technology Support Service System*	*Exploratory Support Service System*	*Exploratory Support Service System*	*Exploratory Support Service System*	*Exploratory Support Service System*	*Exploratory Support Service System*	*Exploratory Support Service System*
			Architectural service	Water service	Cultivation Service	Cultivation Service	Power Service	Medical Service	Information Service	Communications Service	Transportation Service	Materialization Service	Scientific Discovery Service	Technology Development Service	Learning Service	Recreation Service	Art & Music Service	Consciousness Service
Outputs	**Life Support Service** System	Architectural service																
Outputs	**Life Support Service** System	Water service																
Outputs	**Life Support Service** System	Cultivation Service																
Outputs	**Life Support Service** System	Power Service																
Outputs	**Life Support Service** System	Medical Service																
Outputs	**Technology Support Service** System	Information Service (Storage and Processing)																
Outputs	**Technology Support Service** System	Communications Service (Devices and Protocols)																
Outputs	**Technology Support Service** System	Transportation Service (Machines and Protocols)																
Outputs	**Technology Support Service** System	Materialization Service (Machines and Protocols)																
Outputs	**Exploratory Support Service** System	Scientific Discovery Service																
Outputs	**Exploratory Support Service** System	Technology Development Service																
Outputs	**Exploratory Support Service** System	Learning Service																
Outputs	**Exploratory Support Service** System	Recreation Service																
Outputs	**Exploratory Support Service** System	Art & Music Service																
Outputs	**Exploratory Support Service** System	Consciousness Service																

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Table 65. Decision System > Economic Calculation Planning > Habitat Sector Components: *Table show the primary service sector components of the three primary habitat services.*

Matrix of Habitat Sector Components			Habitat Service Sector 1 (Life)							Habitat Service Sector 2 (Technology)							Habitat Service Sector 2 (Exploratory)						
			Resources			Products	Access		Contribution	Resources			Products	Access		Contribution	Resources			Products	Access		Contribution
			Distance	Quantity	Quality	Life	Personal	Common	Team	Distance	Quantity	Quality	Technology	Personal	Common	Team	Distance	Quantity	Quality	Exploratory	Personal	Common	Team
Habitat Service Sector 1 (Life)	Resources	Distance																					
		Quantity																					
		Quality																					
	Products	Life																					
	User Access	Personal																					
		Common																					
	Contribution Access	Team																					
Habitat Service Sector 2 (Technology)	Resources	Distance																					
		Quantity																					
		Quality																					
	Products	Technology																					
	User Access	Personal																					
		Common																					
	Contribution Access	Team																					
Habitat Service Sector 3 (Technology)	Resources	Distance																					
		Quantity																					
		Quality																					
	Products	Exploratory																					
	User Access	Personal																					
		Common																					
	Contribution Access	Team																					

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Table 66. **Decision System > Economic Calculation Planning > Global Habitat Cities and Services**

Cities as Global Habitat Sectors		Intermediate Habitat Requirements (Intermediate Demands)								Final Habitat Demand (Local Demands)				Final Global Demand	
Uses (To) ⇨		City 1 Input (1 … n)				City 2 Input (1 … n)				City 1 Demand		City 2 Demand			
Resources (From) ⇩	HABITAT SERVICES	Service 1	Service 2	…	Service n	Service 1	Service 2	…	Service n	Common Access	Personal Access	Common Access	Personal Access	Total Production	User Access *(type of, time of)*
City 1 Outputs (1 … n)	Service 1														
	Service 2	Intermediate use of local outputs				Intermediate use by City 2 of City 1 outputs				Final use of local outputs					
	…														
	Service n														
City 2 Outputs (1 … n)	Service 1														
	Service 2	Intermediate use of network outputs				Intermediate use of local outputs									
	…														
	Service n														
Priority (Urgency Spectrum) Determination															
Total Inputs															

Services as Local Habitat Sectors		Global Demand								Final Access Demand (Local Demands)				Final Global Demand	
Uses (To) ⇨		Intermediate City 1 Requirements				Final Demand for City 1 Service				City 1 Demand		City 2 Demand			
Resources (From) ⇩	HABITAT SERVICES	Service 1	Service 2	…	Service n	Service 1	Service 2	…	Service n	Common Access	Personal Access	Common Access	Personal Access	Total Production	User Access *(type of, time of)*
City 1 Processing Sector Outputs	Service 1														
	Service 2	Intermediate use of local outputs								Access type of outputs				Gross Demands	
	…														
	Service n														
City 2 Processing Sector Outputs	Service 1														
	Service 2														
	…														
	Service n														
Priority (Urgency Spectrum) Determination															
Total Inputs															

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Table 67. Decision System > Economic Calculation Planning > Global Habitat System

Economic Calculation and Decision Tables		MATRIX Z												MATRIX D		MATRIX P
Habitat Sectoring Unit Matrix Z		Habitat Sector Inputs				Habitat Sector (Inputs)				Habitat Sector (Inputs)						
		Habitat Sector Inputs (Life)				Habitat Sector Inputs (Technology)				Habitat Sector Inputs (Exploratory)				Final Use		Total Produced
Uses (To) ⇨ Produced (From) ⇩		Service-Object 1	Service-Object 2	…	Service-Object n	Service-Object 1	Service-Object 2	…	Service-Object n	Service-Object 1	Service-Object 2	…	Service-Object n	Common Access	Personal Access	Total
Habitat Sector Outputs (Life)	Service-Object 1															
	Service-Object 2															
	…															
	Service-Object n															
Habitat Sector Outputs (Technology)	Service-Object 1															
	Service-Object 2						Matrix Z							Matrix D		Matrix P
	…															
	Service-Object n															
Habitat Sector Outputs (Exploratory)	Service-Object 1															
	Service-Object 2															
	…															
	Service-Object n															
Priority and Urgency Determination																
Total Inputs Required																
Rules	Cases of a Solution	Solution Option 1…n	Solution Option 1…n	…	Solution Option 1…n	Solution Option 1…n	Solution Option 1…n	…	Solution Option 1…n	Solution Option 1…n	Solution Option 1…n	…	Solution Option 1…n	Common Decision Option 1…n	Personal Decision Option 1…n	
Conditions																
Conditions 1	Objectives Ability Design Optimization Protocol	T	T		F	T	F		F	T	T		F			
Conditions 2	Parallel Value Alignment Protocol	F	T		T	T	T		F	T	T		F			
Actions																
Action 1	Reject Solution	x	-		x	x	x		x	-	x		x			
Action 2	Accept Solution	-	x		-	x	-		-	x	x		-			

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Table 68. Decision System > Economic Calculation Planning > Global Habitat System: *Table showing habitat service system outputs to the three types of access: 1) team access to the habitat service contribution system; 2) User demanded access to common and personal objects and services (or, products).*

Services as Local Habitat Sectors			City 1 Processing Sector Human Access Types									Final Global Demand
			Life			Technology			Exploratory			
		Uses In (To) ⇨	Contribute	User Demand		Contribute	User Demand		Contribute	User Demand		
	Products Out (From) ⇩	HABITAT ACCESS	Team	Common	Personal	Team	Common	Personal	Team	Common	Personal	Total Production
City 1 Processing Sector Outputs	Life	Fixed										
		Flexible										
		Cyclical										
	Technology	Fixed										
		Flexible										
		Cyclical										
	Exploratory	Fixed										
		Flexible										
		Cyclical										
Value(s) Added												
Total Inputs												

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Table 69. **Contribution***: Tasking contribution status.*

Contribution Coordination Data For Determining Task Priority	
Urgency/Criticality Weighting	Contribution/Participation Criticality Weighting
4	Insufficient contribution to sustain service; all scheduled 'operations' periods are currently empty, and there is insufficient backup/redundancy or insufficient training for project needs.
3	Insufficient contribution to sustain service; all scheduled 'operations' periods are currently empty, but there is sufficient backup/redundancy or sufficient training for project needs.
2	Insufficient contribution to sustain service, all scheduled periods have contributors, and there is insufficient backup/redundancy or insufficient training for projected needs.
1	Insufficient contribution to sustain service; some scheduled 'operations' periods are currently empty, but there is sufficient backup/redundancy or sufficient training for project needs.
0	Sufficient contribution with adequate backup/redundancy and adequate levels of education/training to ensure future sustainability of the service.

Table 70. **Contribution***: Tasking contribution status.*

Contribution Coordination Data For Determining Task Priority	
Urgency/Criticality Weighting	Contribution/Participation Criticality Weighting
1	No contribution at this time.
2	Insufficient contribution to maintain service; some scheduled 'operative maintenance' periods are currently empty.
3	Insufficient, all scheduled periods have contributors, but there is; insufficient backup/redundancy or insufficient training for projected needs.
4	Sufficient contributors with adequate backup/redundancy and adequate levels of education/training to ensure future sustainability of the service.

Environmental Inquiry Accounting

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Abstract

Assess the real world impacts, costs and benefits of an issues resolution, to identify those solution designs that meet (or do not meet) a strategic economic feasibility threshold of ecological sustainability, which involves at least the variables of: ecological carrying capacity; habitat damage; regeneration and consumption rates; and behavioral changes due to the modification of [structural] systems dynamics. Environmental inquiry acquires data and does analysis to determine thresholds for a sustainable and minimal (or, least harm) impact approach to environmental interactions. An environmental assessment inquiry emphasizes the need for environmental accounting, impact assessments, sustainable materialization practices, and the integration of life-cycle analyses to mitigate environmental impacts and promote sustainable development.

Graphical Abstract

Image Not Yet Associated

1 Environmental accounting and inquiry

If humanity desires its needs fulfilled, then it must fulfill (or at least not inhibit the fulfillment of) the needs of its ecological environment, which is humanity's lifeground. Humanity is 'viable' [in part] when its outputs do not significantly hinder the needed fulfillment of a greater ecology in the continued recycling of its many natural services. Humanity must account for the environment in the designed re-planning of its services. The process of Environmental Inquiry is the process of identifying the knowable impacts that a particular solution configuration will have on our social community and our environmental habitat. It is a form of environmental analysis where environmental economic effects are processed in the form of an evaluation (as a form[ed tool] of 'differentiation'). It is an inquiry into the environmental viability of a solution. The process of Environmental Inquiry is the process of assessing the potential damage to ourselves, our environment, and the continuation of our common resources for the particular configuration of resources that form a designed solution to an issue, and it is based upon resource trending data and evidence from the environment, which the decision system directly and explicitly accounts for. Environmental inquires (e.g., surveys) give the decision system more data to more greatly consider optimal potential selectable decisions.

The term "placemaking" refers to the shaping (re-configuring) of a[n physical] environment. The shaping of an environments has tremendous social and psychological implications for how people in the world think. Part of the idea of 'justice' is the underlying application of a spatial strategy involving 'access' (and not "property ownership"). By developing material space in particular kinds of ways it is possible to counter those impulsive, compulsive, and less serving forces that may exist within and around us, structurally. We can design structural environmental systems that facilitate our experience of certain states of existence, and not others.

The design of a living space influences the individual and social behaviors of those people interacting within the space. Nowhere is this subject apparently more researched then in the scientifically studied arrangement of classrooms and office spaces. To some degree there is a relationship between the qualities of the structure in an environment [of structure] and the emergent behaviours of the individuated sentience in that structure [who conform to some degree to the qualities of the structure]. Here, we ask, what qualities does our designed structure have that cause it to deviate from what we know is our optimized fulfillment?

The big social question about producing spaces, places, and environments is not the question, "what do we want them to look like?" It is instead a question of "what kind of future do we want to create for ourselves?" What kind of values do we want to maintain in our social interactions with one another. What types of social relationships do our structural designs, for our environment, reinforce in us? What kind of people do we want to be, and what kind of social relations do we want to maintain? The social/political/economic question of space and place and environment is partly about being able to integrate these concepts in such a way that it allows for the continuous fulfillment of our purpose, a movement toward a higher potential [environment of thought responsive creation].

A truly sustainable economy maintains an economic model that accounts for the environmental impact of its actions (i.e., negative externalities and environmental decision constraints). A society's economic impact on the environment cannot be neglected if the community seeks its own preservation, its survival. To neglect the impact one's actions have on the environment is to act without an orientation toward fulfillment, to act with negligence. The costs of an economic action on the environment are scientifically discoverable and critically knowable. For a sustainable community to exist there is an absolute requirement to make all environmental impacts (a.k.a., "costs", true costs, real-world costs, etc.) are known. If the true and real-world impacts ("costs") of an economic action are known and accounted for, then economic practices become transparently classifiable as sustainable or unsustainable [given capacity and resource availability]. Under such a system many early 21st century economic practices would be seen for what they are, negligent, due to their high environmental impact costs. The factual concept of a "true cost", if applied holistically, would make some economic practices perceptible for what they really are -- a socio-economic dis-alignment with the fulfillment of human need.

Real world impacts/costs represent external constraints on the resolution of issues. Real constraints include but are not limited to: the carrying capacity of the environment (or a particular system); environmental pollution (cumulative & synergistic); and the rates of consumption and resource regeneration. Any modern, technological economic system that does not account for real world costs is highly likely to cause severe damage to its habitat because modern technologies require the handling and use of organotoxic compounds, which are unlikely to be effectively accounted for in the market [as they are considered "externalities"]. Externalities - some exchanges have a spillover effect where they damage the environment and relationships there. Market-based systems primary treat reality (i.e., the air, water, soil and other life upon which humans depend), not as primary, as it needs to be for survival and thriving, but instead, it is treated as an externalized resources for individual [consumer] benefit and a place for waste. Which is a view that is unsustainable by its very definition. Early 21st century society's technologies produce pollution - environmentally damaging substances and by-products. If environmental costs are not accounted for by an economic system, then those who participate in such a system should expect their actions to cause persistent and sustained damage to their environment.

In society, there is a need to think through externalities in the design process. What are the externalities of the design; what may be affected by this design that the design isn't intentionally designed to account for and effect. There are two generalized categories of organismal need, and hence, two categories of possible externality:

1. Physical externality - mediated by technology that causes physical effects. Physical causation can create physical externalities, which are effectively harmful physical unintended consequences. For example, the creation of a pesticide to support crop growth, and it ends up getting into the water supply, killing pollinators, and harms ecosystem.
2. Psychosocial externalities - mediated by technology that incentivizes humans to behave differently. The effect is psychological and when it starts to happen to many people, then there is a social effect. The more likes some post gets the higher it is ranked and the more people see it, because of the algorithm, and the more people believe it, because other people like it. If one military develops a technology, it often obligates the other rival militaries to develop the same technology (or even more advanced technologies) in response.

Necessary questions about the "externalization" of harm include, but are not limited to:

1. Whose needs are being factored?
2. Identify all stakeholders, including human and non-human life, that will be affected by second and third order physical and psycho-social harms (externalities)
3. Are there any needs not being factored (accounted for) that ought to be?
4. How do we do our best not to create "losers" and externalize harm?
5. What are the standards for harm; how are the standards set for harm (e.g., for pollution):
   A. Harm can be done.
   B. How much harm is acceptable for what level of strategic fulfillment.
6. How are consequential harms being balanced with the human requirements to provide sufficient and optimized fulfillment of human needs.

2 Environmental impact assessment deliverable

All human activities involving construction (e.g. roads, habitats, ports, etc.) or natural resource extraction (e.g. mining, logging, etc.) typically generate multiple interacting and usually "negative" impacts on the environment in concern to its biota and ecological processes. In most States, these environmentally impactful activities are regulated (by the State) and cannot commence without formal environmental approval (by the State). A significant deliverable as part of this approval process is the environmental impact assessment (EIA) (Drayson et al., 2015; Glasson and Therivel, 2019). An environmental impact assessment (EIA) relies on rigorous scientific assessment of all potential causal pathways by which large-scale developments may impact on valued assets in a region. The purpose of an environmental assessment is to inform decisioning by producing a complete analysis of causal pathways, a complete spatial assessment, with complete transparency. An environmental assessment assesses the environmental impacts associated with some solution, project or plan. To resolve the inquiry it is necessary to acquire site-specific (context-relevant) data on most/all of the relevant environmental parameters and valued assets, and then, integrate that data with the current solution to determine alignment with community objectives.

The process of Environmental Inquiry involves environmental impact assessments. An environmental impact assessment (EIA) is an assessment of the possible positive or negative impacts that a proposed project may have on the environment, including the biophysical environment and social environment. Socio-physical feedback data is necessarily involved in this inquiry process to identify the impact a service solutions is having, or has had, on our total environment. Also, an ‘environmental [feasibility/viability] study’ might identify additional information needs and deficiencies, and clarify or modify the rationale for why a particular solution is more efficient, safe, value-oriented, and strategically meets our needs.

A comprehensive habitat viability study is continuously ongoing within the decisioning system. In other words, it is an ongoing task of an interdisciplinary team to study and otherwise evaluate the viable capacity of the system as it is deigned utilizing all available information in the context of an issue. Viability studies provide evidence and may resolve individual and scientific concern that were previously lacking in information. An environmental impact study may be necessary before the transported application of a resource is “made into service” in order to maintain the safe operation of the habitat service system.

It is essential for the process of adaptation for a Habitat system to have multiple forms of feedback. Don’t we all want to know how our designs are affecting us so that we can more intentionally (and safely) design. The habitat service system maintains interdisciplinary environmental assessment teams.

In a sense, the process of Environmental Inquiry represents a continual scientific investigation into the results of our tasked behaviors on a responsive environment that to some measurable degree determines our continued viability (and feeds our Real World model with data).

Environmental assessments often include an assessment on the expected pollution of a design. Pollution is an undesirable form of emanation. It either damages the environment or prevents the environment from restoring itself. It should be noted here that those living in early 21st century society, particularly those living in cities, have become desensitized to some forms of pollution (particularly those of light and sound). In a sense, pollution is a dis-alignment of our patterns with evolutionary patterns. For example, the usage of lighting which emits blue and green photons of light at night disrupts our melatonin production, which has a host of health ramifications including the onset of sleep pressure and sleep quality.

2.1 Assessment documentation

An environmental impact assessment may be produced based on a network analysis of potential causal pathways in a given region and/or for a habitat construction.

2.1.1 Environmental inquiry (causal-chain) assessment flow map/model

A.k.a., The scope of the environmental assessment, the environmental assessment procedure, pathway environmental assessment.

The causal map includes a spatially explicit analysis of the region (habitat) that allows residual risk (i.e. risk remaining after all feasible mitigations) to be mapped for all valued assets. This identifies which activities could lead to potential impacts of varying concern (rated from ‘very low’ to ‘very high’), their likely pathways, which valued assets are at risk and where these residual risks are greatest. The output maps reveal where there are concentrations of risk ("risk hotspots") which require more detailed local-scale assessments and monitoring.

The visualization of a systematic mapping of the cause-and-effect chain of relationships makes it possible to identify:

1. All possible pathways (relationships) between a starting node and end node.
2. Where mitigation methods can be applied.
3. Which mitigation methods may be effective.
4. Mitigation methods that affect multiple pathways.
5. Level of redundancy in mitigation methods along pathways.

NOTE: *It is important to combine "life-cycle assessments" with "environmental assessments" to provide a complete production life-cycle solution.*

A simplistic box-and-arrow diagram of a environmental inquiry situation may be developed to visualize the information within the assessment space. Wherein, boxes represent stressors and ecosystem components (including valued assets) and arrows represent the pathways and processes (mechanisms) by which stressors cause impacts on valued assets. Here, it is important to illustrate likely relationships between activities and environmental impacts. A formal analysis will verify whether the factors are internally consistent, and explore all the mapped pathways between activities and impacts. A causal network is a graphical representation of relationships (pathways represented by links) and conditions (nodes, represent by activities, stressors, processes and valued assets) in the system being assessed. The links represent the cause-and-effect relationships between nodes. The nodes can be considered the conditional effects, and the pathways describe impacts. (Peeters, et al., 2022)

For each causal pathway where there is a concern (risk), the network (flow) approach provides a systematic evaluation of the:

1. Likelihood (of incident occurring).
2. Consequence (of occurred incident under conditions).
3. Mitigation options (control) of the concerns/risks.

Causal pathways extend from conditions (drivers, context/situation) to issues to resources to solutions to tasks, and then to, results. This environmental impact method includes analysis of the confidence of these evaluations, recognizing where knowledge gaps constrain assessments of risks.

The causal-chain map from the source-point of a contextual driver (on the left of the flow-graph) to the contextually desirable end-point (on the right of the flow-graph):

1. **Drivers** *(on "left" of chain-of-flow)* - what is the broader activity set's function, and what are it's key features. The core driver in community is global human need fulfillment, human flourishing and ecological regeneration. In order to meet material human needs, habitats (habitat productions) must be constructed and there services must be operated in order to produce access to life, technology, and exploratory goods and services. In order to produce habitat services there must be:
   A. Resource development, for example:
      1. Drilling Wells, having pipelines, etc.

2. Intermediary production.
B. Habitat production operations, for example:
1. Contribution services.
2. Life support services.
3. Technology support services.
2. **Activities** - describe individual activities necessary to develop something (e.g., a gas resource or a whole habitat). Some activities would be unique to certain drivers, whereas other would be common to nearly all drivers, such as clearing and transport of material. For example,
A. Drilling, hydraulic fracturing, civil works for clearing, access to water, disposal of waste, transport material in and out, constructing of architectural-infrastructure.
B. After construction there are ongoing and cyclically required activities to operate and maintain the system.
3. **Stressor nodes** (e.g., blue linked nodes) are stressors - what do these activities do to the surroundings, how do they impact the environment and environmental processes, and what is the stress they put on the environment. Some stressors are separate and others are common (i.e., common to all habitat productions, such as clearcutting, etc,). For example,
A. Land clearing.
B. Removal of flora.
C. Removal of fauna.
D. Bringing in non-local species of flora or fauna.
E. Extraction of water from the environment.
F. Release of water (possibly contaminated) into the environment.
G. Etc.
4. **Process nodes** (e.g., red linked nodes) are natural and human activity processes. Processes are the processes in the environment, which don't really change. For example,
A. Light pollution.
B. Soil contamination.
C. Aquifer recharge.
D. BioSpheric cycles:
1. Climate cycle.
2. Soil cycle (pedogenesis).
3. Photosynthetic cycle (photosynthesis).
4. Etc.
E. **Emissions** (e.g., waste streams) are natural and all activity produces (i.e., all life processes produce) them.
5. **Endpoints** *(on "right" of chain-of-flow)*- are objectives (agreements about the real-world that have been identified as being something to be cared about). The endpoints that are have the impacts assessed on. There will (or, will not) be impacts on assessed endpoints. Some of these impacts can, and others cannot, be mitigated by existing or new controls. The resulting risk for that which there is no possible control, is called, residual risk.

Mitigation is an inherent part of risk control and represents the potential for diminishing and/or eliminating a concern, and its impact if realized. The mitigation process involves the following steps:

1. Identify causal mapping of drivers, activities, stressors, processes, and endpoints.
2. Identify relationships (pathways) of concern.
3. Developing a mitigation solution or, master-plan modifying solution).
4. Constructing mitigation solution.
5. Compliance (to mitigation solution standard).
6. Enforcement (of existing controls).
7. Monitoring (of the effectiveness of controls).
8. Standards create code, and then, regulators enforce compliance with that code.

2.1.1.1 The causal flow-chain assessment procedure

This procedure results in a model that visualizes drivers connected to endpoints, and an intermediary "space" that reveals new information on the impact of the solution to the environment, including potential mitigation controls, residual risks, and confidence levels.

The following is one method for evaluating a solution in the context of an environmental inquiry protocol (Peeters, et al., 2022):

1. Identify solution to be analyzed in the context of a potentially impacted environment and set of community strategic preservation objectives.
A. Identify the drivers of the issues that make-up the solution.
B. Specify activity (activities) and development scenario(s).
C. Define potential impact area (PIA) and/or population (PIP) = maximum spatial/population extent of potential impacts [space].
1. PIA (potential impact area) = the maximum spatial extent over which potential impacts of the proposed project are considered.
2. PIP (potential impact population) = the maximum population extent over which potential impacts of the proposed project are considered.
D. Define potential impact duration (PID) = likely duration of direct, indirect, and cumulative [time].
E. Compile and map all valued assets; to complete the context-setting step, it is necessary to:
1. Compile and map all valued ecosystem

service-assets (e.g. protected species, significant wetlands, etc.) that do or may occur in the PIA.
2. Compile and map all the valued habitat service-assets (e.g., medical services, water services, etc.) that do or may occur in the PIA.

F. Identify valued habitat infrastructural assets and map their distribution to PIA (geographically) and PIP (among a population).

G. Identify value eco-system assets and map their distribution to PIA (geographically) and PIP (among a population).

2. Establish conceptual model and identify development activities. All -logical systems, can be understood through concept models. An ecological concept model, for example, is necessary for visualizing the multiple interacting pathways by which human behaviors (anthropogenic drivers) impact those things humans say they care about.
    - A. Construct conceptual model of key eco-system processes.
    - B. Construct conceptual model of key habitat-system processes.
    - C. Systematically identify development activities that may affect processes.
    - D. Most activities generate stressors (e.g., vegetation removal, drilling, groundwater extraction, etc.). These activities that result in links ("ropes") of stress have impacts on assessed endpoints. Activities change the environment -- changing characteristics (e.g. rate, magnitude, frequency, direction) of naturally occurring processes. A good conceptual model identifies with confidence the pathways by which these impacts may occur, revealing interactions with each other as well as from other drivers.
3. Create a causal network flow model. After concept construction, it is possible to represent the information as a directed acyclic graph (DAG) in which the nodes represent the drivers, activities, stressors, processes and endpoints (assessed), and the links are the inferred causal relationships between those nodes. To clearly define each node, the following must be available: current knowledge base, relevant knowledge gaps and key assumptions, which provide transparency about the assessment and ensure internal consistency throughout the network.
    - A. Encode conceptual model and activity list as directed non-cycling (acyclic) graph.
    - B. For each link assess on regular grid of PIA and PIP for PID. For all types, state:
        1. Direction of relationship (direct or inverse). Specify whether each relationship is either direct or inverse.
        2. Evaluate risk:
            - i. Likelihood - How likely within some contextually relevant amount of time is it likely to become an incident (a realized risk, an event)? Refers to whether a link is possible; if so, can it lead to a material change (consequence), and if so, can this risk be avoided or mitigated? Any link represents a causal relationship. A link can be evaluated as "not possible" if it is:
                1. Extremely unlikely.
                2. Illegal (i.e., standards violation).
                3. Was inferred from observations outside the potential impact area (PIA) yet is not physically possible within the PIA. Nonetheless, the link is preserved in the network to indicate that it can contribute to a potential pathway of impact in the future.
            - ii. Consequence - Flow links (arrows) can be of five types. Impact evaluation questions (yes or no answers) on the links. Use the following decision-tree to decide consequential impact assessment level:
                1. Link is possible or not?
                    - a. Could a change in A cause a change in B.
                2. Link is possible, but not material?
                    - a. Could a material change in A cause a change in B.
                3. Link is possible, and material [change], but can be avoided?
                    - a. Could a material change in B due to a change in A be avoided in the spatial area.
                    - b. What is the material change?
                    - c. What is the threshold of effect of the material change?
                4. Link is possible, material and unavoidable, but can be mitigated?
                    - a. Could a material change in B due to a change in A be minimized or mitigated in the spatial area.
                5. Link is possible, material, unavoidable, and cannot be mitigated?
            - iii. Impacting link assessment level (i.e., the links has a value from 0-4 assigned, usually represented with unique colors):
                1. 0 = Link is not possible.
                2. 1 = Link is possible, but no [material] change occurs.
                3. 2 = Link is possible and [material]

change, but can be avoided.
4. 3 = Link is possible, [material] change occurs, but can be mitigated.
5. 4 = Link is not possible, [material] change occurs, is unavoidable and cannot be changed.

iv. Mitigation controls.
1. Identify control measure.
2. Identify residual risk.
a. Residual risk likelihood.
b. Residual risk consequence.

v. Confidence in evaluation. A rating of confidence ('high' or 'low') for:
1. Likelihood.
2. Consequence.
3. Mitigation.

4. Create a spatial causal map. Plot on a geographical map a spatial analysis of stressors, processes and assessment endpoints. The inquiry/study area will cover some geographic area of land and/or water body (Read: map). Use at least a topographic-hydrological map. Show the area and intensity where the stress is occurring. If the driver involves extraction activities, then the map will also show prospectivity.
5. Create a table of the level of concern for activity, stressor and process for each endpoint. Each cell in the cross-tabular area is colored. The amount of area covered in color in each cell illustrates the level of concern. The colored area is proportional (on a scale from 0% to 100%) to the percentage of each assessed endpoints distribution mapped with that level of concern.
6. Evaluate causal network flow map/model.
A. Evaluate causal pathways to create list of hazards. Hazards interact. Hazards have a likelihood, consequence, and mitigation options.
B. Combine link assessments to assess residual risk.
C. Develop a monitoring plan.
D. Integrate the results into the information system.

Each link in the resulting causal network has three attributes by which risk is evaluated:

1. Relationship direction (i.e., direct or inverse).
2. A grid with ordered categorical assessment scores (i.e., link is not possible, possible, material change, etc.).
3. A rating of confidence ('high' or 'low') for likelihood, consequence, and mitigation.

Analysis (assessment

1. Looking at all the different pathways what would be the impacts?
2. The squares represent the level of concern of pathways and the percentage of the endpoint area that may be impacted.
3. Size of the square relates to amount of impact.

2.1.2 Stressors

Some common stressors where there are material changes include, but may not be limited to:

1. Compromised aquitard integrity.
2. Atmospheric emissions.
3. Groundwater extraction.
4. Compromised well integrity.
5. Operation of industrial machinery.
6. Accidental release.
7. Controlled release of wastewater.
8. Dust generation.
9. Vehicle movement.
10. Surface water extraction.
11. Storage ponds.
12. "Invasive" plants.
13. "Invasive" insects
14. Vegetation removal.
15. Soil compaction.
16. Waste disposal.
17. "Invasive" herbivores.
18. "Invasive" predators.
19. Overland flow obstruction.
20. Artificial water sources.

2.1.3 Processes

Some common processes include, but are not limited to:

1. Human cause:
A. Light pollution.
B. Air pollution.
C. Noise pollution.
D. Soil contamination (soil pollution).
E. Ecosystem burning.
F. Competition and predation.
G. Soil erosion.
H. Channel flow
I. Bank instability and erosion.
J. Aquifer contamination.
K. Surface water contamination.
L. Mortality of native species.
M. Habitat degradation, fragmentation and loss.
N. Floodplain inundation.
O. Souring.
P. Sedimentation.
2. Ecosystem services (a.k.a., bio-spheric cycles):
A. Climate cycle.

B. Aquifer recharge.
C. Soil building cycle (pedogenesis).
D. Photosynthetic cycle (photosynthesis).
E. Micro-organism life-cycles.
F. Macro-organism life-cycles.

2.1.4 Factors of reality-as-environment analysis

A.k.a., Systematizing and environmental factors of analysis.

During analysis of environmental factors, it is important to look at collective impacts of the range of activities associated with the master-plan (solution): development, construction, and operation of the specified solution. The purpose of a causal-spatial environmental network map and assessment is to provide a systematic, consistent and transparent analysis/assessment of potential impacts (to the whole environmental context by the solution), in order to improving the quality of decisioning about planned developments and their environmental risks. (Peeters, et al., 2022)

An environmental evaluation using these factors should be:

1. Investigatory, intelligent.
2. Systematic, transparent, robust.
3. Statistical (identifying likelihoods), consequential (evidence-based), and apply appropriate mitigation actions (task control).
4. Know, and seek to know, knowledge gaps.

All environmental inquires include an assessment of the concern/risk of harm/damage to an environment by human behavior. All factors in the model have some consequence with a level of concern, or no pathway for concern. All relationships/links take one of the following forms [of concern/risk] (Peeters, et al., 2022):

1. **Potentially high concern** - for "possible, material, unavoidable and cannot be mitigated" (4) because impacts cannot be avoided or mitigated at the scale of the potential impact area.
2. **Potential concern** - for "possible, material and unavoidable but can be mitigated" (3) because impacts can be minimised or mitigated by existing management controls.
3. **Low concern** - for "possible and material but can be avoided' (2) or 'possible but not material" (1) because impacts are avoided due to current legislation or because the impact does not represent a material change
4. **Very low concern** - for "not possible" (0) because impacts are not physically possible or are extremely unlikely.
5. **No pathway** (no concern).

Environmental impacts are the manifestation of risks to the environment. An environmental impact statement (EIS) document typically includes the following categorical sub-sections (criteria categories):

1. Introduction.
2. Project approvals.
3. Sustainability.
4. Risk assessment.
5. Stakeholder engagement
6. Project definition.
7. Climate and climate change adaptation.
8. Land, geology, geomorphology & land contamination.
9. Land use planning.
10. Landscape and visual amenity.
11. Terrestrial ecology.
12. Water and aquatic ecology.
13. Ground water.
14. Surface water and water course.
15. Air quality.
16. Greenhouse gasses.
17. Noise and vibration.
18. Waste.
19. Traffic and transport.
20. Indigenous and non-indigenous cultural heritage.
21. Social impact assessment.
22. Economic assessment.
23. Hazard and risk.
24. Matters of national environmental significance (protected matters)
25. Fauna (species of fauna).
26. Flora (species of flora).
27. Reserve ecosystem(s).
28. Other matters.
29. Environment impact coordination ("management") plan.
30. Cumulative impact assessment (cumulative impacts).

Note that sometimes these environmental "factors" are referred to as environmental "assets", each of the following representing categories of asset class.

The primary environmental assets are:

1. Land - terrestrial environmental quality; land-form; terrestrial ecosystem.
2. Water - water environmental quality; aquatic ecosystem; hydrological processes.
3. Sea - coastal processes; marine environmental quality.
4. Air - air quality; atmospheric processes.

5. People - team processes; user processes.
6. Other animals - organismal environmental quality; bio-region processes.

Environmental assets (objects) include, but are not limited to:

1. Aquifers.
2. Ecosystems.
3. Significant species.
4. Etc.

Environmental conditions (object interactions) include, but are not limited to:

1. Sightline conditions.
2. Atmospheric conditions.
3. Soil conditions.
4. Sound conditions.
5. Light conditions.
6. Waste conditions (Read: material cycling conditions).
7. Hazard conditions.
8. Etc.

2.1.4.1 Risk factor

> **NOTE:** *Always make sure links in the assessment are actually possible. There may be things that just can't happen because the legal and or physical law doesn't let "you".*

Environmental inquiries include an inquiry into the risks of the solution to the environment. Herein, the following questions are significant in determining the level of risk:

1. It is possible for the risk/concern to become an incident; is the risk likely?.
2. Can the risk be avoided; can something be done to completely (99%) avoid the risk?
3. If it cannot be avoided, can it be mitigated; can the impact/consequence of the risk be reduced somehow when it is realized?

Terms associated with the level-of-risk (level-of-concern) include:

1. **Precaution (data collection tasks):** Refers to an action taken in advance to prevent potential harm or minimize risk.
2. **Mitigation (control tasks):** Involves actions or measures taken to reduce or minimize the negative impact or risk associated with a particular situation or event.
3. **Caution (monitoring tasks):** Implies care, attentiveness, and awareness of potential dangers or risks, when deciding, thinking and acting.

The primary eco-system service inquiry looks for overshoot (including, potential overshoot) of capacity. Overshoot means to have exceeded carrying capacity of some ecosystem-/production-service.

It is possible to overshoot capacity in two ways:

1. **By taking too much:** Will the operational system (plan, human being) use the products of ecosystems faster than they can regenerate?
2. **By polluting too much:** Will the operational system (plan, human beings) dumping waste into the ecosystem at a rate faster than the assimilative capacity of an ecosystem?

2.1.4.2 Emission factor

A.k.a., Pollution factor.

Anything emitted is referred to as an emission. Something which is pollution is something that is emitted in too large a quantity or in the wrongly location. Emissions are typically waste streams, some of which may be pollution streams (as in, emissions that harm people and ecologies).

There are multiple forms of emission, and hence, pollution, that must be accounted for through an environmental assessment to insure decisioning is informed of assessed consequences of the master plan, developed within the decision system of society:

1. Atmospheric.
2. Electromagnetic radiation (i.e., EMF/EMR).
3. Light (i.e., photon and wavelength; light is a form of electromagnetic pollution).
4. Sound (i.e., noise) - mechanical wave that passes through a physical medium.
5. Material as chemical and biological (e.g., garbage & pharmaceutical hazards/metabolite hazards).
6. Cognitive & visual (e.g., the very notion of ‘advertising’ could be considered a form a form of visual and cognitive pollution).
7. Time (as general relativity and technical inefficiency).

2.1.4.3 Recyclation factor

A.k.a., Recyclability factor, recycling factor.

Most environmental assessments also include an assessment on the recyclability of the resource, service, or system. To remain environmentally sustainable, resources must either be safely and timely recycled or they must be safely and timely decomposed, otherwise they risk becoming pollution that accumulates damage in the system. The accumulation of damage increases uncertainty [of the systems stability] and it signals the decay of the system. In community, we creatively construct our mapped systems through feed-back from an environmental terrain.

> **INSIGHT:** *It is a weird thing to do to take sensory input coming in from your environment and try to tune it out. A lack of situational awareness would have essentially resulted in the death of indigenous people. In other words, what would have essentially resulted in death in an indigenous person is locking out sound signals from the environment. If they weren't attuned signals from their environment they would be dead quickly. Early 21st century society creates so much "racket" that people are forced to tune out the signals. It is essential for us to observe changes in the signature of life around us.*

2.1.4.4 Strength, weakness, opportunity, threat factor

Harm to a present ecology may be capable of having its ecology restored and/or fit back-into the larger ecology, most notably, after mining (or another extraction operation). It is essential to balance human needs for material fulfillment with ecological consequences and future potential restoration activities. Environmental assessments must account for the benefit to human need fulfillment in the context of temporary harm to an ecology, to later plan and following through with restoring the ecology once the extraction is complete. Develop a strength, weakness, opportunity, threat (SWOT) matrix showing the standards for human fulfillment against the pollution-/harm-based consequences of production. Identify the standards [continuum] of pollution and the level of acceptability in each individual case.

2.2 Sustainable materialization

A.k.a., Sustainable master-plans.

A sustainable solution is within the thresholds of the capacity of a biospheric ecological service system today, and into the future.

In technology production, sustainability involves developing and manufacturing products and services, together as habitat, using:

1. Processes that minimize environmental impact, and where there is impact, it is appropriate for fulfillment (more appropriately viewed as care-taking).
   A. Ensure the earth is caretaken. Monitor that the earth is caretaken (as a national contribution service).
2. Decision processes that produce durable and appropriately lasting materializations.
   A. Ensure the appropriate longevity and responsible disposal of all produced objects (i.e., cycle all materials associated with trashed technologies). Monitor decisioning about society and the habitat (as a national contribution service).
3. Socio-technical systems that minimize energy consumption, as appropriate.
   A. Ensure all electrical technologies are energy efficient given what is known and available. Monitor service usage (as a national contribution service).
4. Habitat service operations that respect human time.
   A. By rewarding labor hours and pricing habitat goods and services through some token[ization] system.
      1. Labor tokens with priced market (more-or-less) services and goods.
      2. Beneficial-to-self (e.g., biking).
      3. Beneficia-to-others (e.g., volunteering).
      4. Generational wealth transferred to community commons (i.e., the transfer of information, resources and people into a community-type conficuation).
   B. By rewarding intrinsically through participation in a global contribution service system during some duration of one's life, in a way one prefers, given availability and qualification. Here, there are no tokens traded for contribution or for access.
5. Habitat systems that cycle material resources without eco-system harm, as appropriate.
   A. Ensure materials are cycled through the global habitat and the larger biosphere in a way that does not cause chronic ecosystem harm, that does not harm healthy organisms, and has low-relative pollutive potential. Monitor the flow of material through the global habitat and the larger biosphere.

It aims to create technology that is environmentally friendly, energy-efficient, and has minimal adverse effects on ecosystems and natural resources.

2.2.1 Pollutionless materialization

I.e., Less pollution, less waste, accountability for pollution and restoration over time.

In the pursuit of sustainable and environmentally responsible production and manufacturing solutions, it is paramount to prioritize the concept of pollution prevention at every stage of the product life-cycle. To achieve this goal, it is essential to adopt a holistic approach that envisions a complete flow of resources that assemble into, and dis-assemble from, any given product; visualizing the complete flow of resources from inception to ultimate disposal and cycling. By visualizing the entire life-cycle of production, master plan decisioning can identify potential environmental impacts and inefficiencies at each step, allowing for proactive mitigation measures. This approach not only facilitates the reduction of pollutants, but also promotes resource efficiency and the care-taking of nature. Ultimately, embracing production practices that seek the least pollution not only benefits the environment and human health, but also enhances product quality, reduces operational costs, and aligns with sustainability objectives.

> **CLARIFICATION:** *"Pollutionless" does not mean that there is never pollution; it simply means that there is the least (less) amount of pollution possible, given requirements and materials, and the life-cycle accounting over time of ecological and habitational resources.*

Life-cycle analyses need to occur to account for material transfers into and out of functional [product-habitat] assemblies. These life-cycles need to account for losses of material as "waste" plumes (a.k.a., pollution) into the environment. Pollution is generally considered a waste plume into the environment that damages (has significant negative impacts) entities and/or relations. Life-cycle assessments, analyses, and models need to go to sufficient depth to appropriately visualize all material transfers. For example, when synthetic plastic microfibers from clothing are washed, the microfiber plastics end up in the output water. Where do those plastics go? How long do they last? What is their influence on the environment (with the following potential influencing parameters):

1. Unkown influences.
2. Neutral influences.
3. Influences negative to ...
4. Influences positive to ...

It is important to visually trace the flow and composition (assembly type, structure type, status type, and quality type) as they flow through the ecosystem, and therein, the human habitat network (i.e., the network of community cities, or 'community-city' network.

2.2.2 Contamination materialization

Contamination is a failure mode of production. After contamination, a clean-up process must be engaged to remove any contaminants that occurred during the process of a chemical compound and or a physical assembly's formation.

Scholarly references (cited in document)

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TABLES

Table 71. *Simplified strengths, weaknesses, opportunities, threats (SWOT) matrix.*

4 LISTS	Positives	Negatives
Capabilities	Strengths (Abilities)	Weaknesses (Inadequacies)
Results	Opportunities (Goods)	Threats (Bads)

Table 72. *Strengths and weaknesses, threats and opportunities (SWOT) matrix for analysis of events, scenarios, and strategies in concern to their impact certainty and impact scale.*

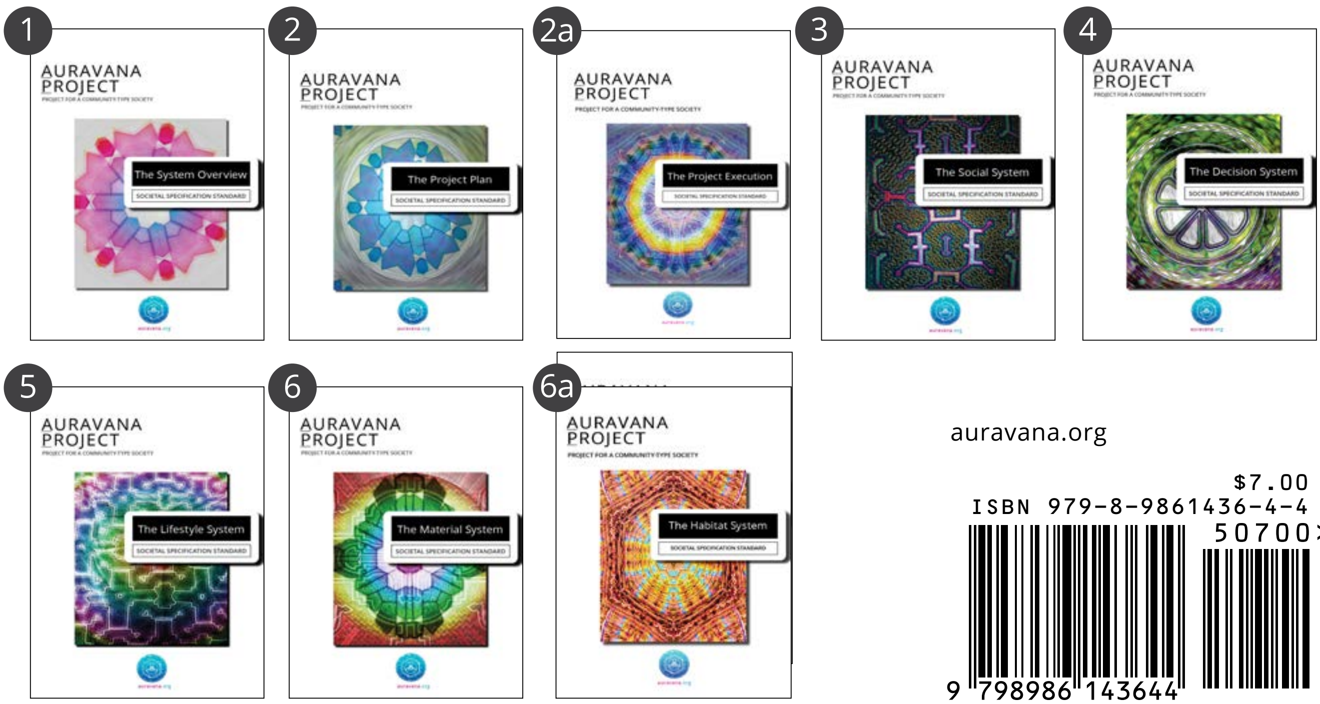
Benefits / Opportunities / Advantages / Strengths						Impact Scales	Risks / Liabilities / Threats / Weaknesses					
8	9	10	11	12	13	Global [7]	8	9	10	11	12	13
7	8	9	10	11	12	Societal [6]	7	8	9	10	11	12
6	7	8	9	10	11	City/ Habitat [5]	6	7	8	9	10	11
5	6	7	8	9	10	Institution [4]	5	6	7	8	9	10
4	5	6	7	8	9	Project [3]	4	5	6	7	8	9
3	4	5	6	7	8	Group [2]	3	4	5	6	7	8
2	3	4	5	6	7	Personal [1]	2	3	4	5	6	7
Preventable 0% *(not likely)* 1	Conceivable 20% *(low likelihood)* 2	Possible 40% *(moderately low likelihood)* 3	Plausible 60% *(moderately high likelihood)* 4	Probable 80% *(high likelihood)* 5	Provable 100% *(likely)* 6	**Local**	Preventable 0% *(not likely)* [1]	Conceivable 20% *(low likelihood)* [2]	Possible 40% *(moderately low likelihood)* [3]	Plausible 60% *(moderately high likelihood)* [4]	Probable 80% *(high likelihood)* [5]	Provable 100% *(likely)* [6]
Certainty/Prescience												

The Auravana Project exists to co-create the emergence of a community-type society through the openly shared development and operation of a information standard, from which is expressed a network of integrated city systems, within which purposefully driven individuals are fulfilled in their development toward a higher potential life experience for themselves and all others. Significant project deliverables include: a societal specification standard and a highly automated, tradeless habitat service operation, which together orient humanity toward fulfillment, wellbeing, and sustainability. The Auravana Project societal standard provides the full specification and explanation for a community-type of society.

This publication is the Decision System for a community-type society. A decision system describes the formal structuring of decisions involving a comprehensive information system that resolves into a modification to the state-dynamic of the material environment. A decision system is a collection of information-processing components -- often involving humans and automation (e.g., computing) -- that interact toward a common set of objectives. This decision system is designed to coordinate and control the flow of resources for global accessibility to all goods and services. To navigate in common, humanity must also decide in common. Herein, individuals maintain a relationship to resources that focuses on access rather than possession, maximizing the advantages of sharing, and incentivizing cooperative, rather than competitive, interest. All requirements relevant to human fulfillment and ecological well-being are factored in to the allocation of resources, optimizing quality-of-life for all, while ensuring the persistence of the commons. The standard's decision processes produce tasks that are acted upon by an intersystem (a.k.a., "interdisciplinary") team involving the coordinated planning and operation of projects. Through this comprehensive and transparent decisioning process individuals know precisely what needs to be accomplished to sustain and evolve their fulfillment. Herein, through formalized decisioning and cooperation humanity may continuously restructure society toward a higher potential dynamic of life experience for all. The use of a common social approach and data set allows for the resolution of societal level decisions through common protocols and procedural algorithms, openly optimized by contributing users for aligning humanity with its stated values and requirements.

Fundamentally, this standard facilitates individual humans in becoming more aware of who they really are.

All volumes in the societal standard:



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