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.*

Urgency Prioritization Matrix					
Weighting	**Operational Process & Systems**	**Urgency Assignment Category**	**Continuous / On Demand**	**Characteristics And Criteria**	**The Process**
1	Incident Response	Emergency Response	On demand	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.	(1) The process of reducing and removing risk to human life; (2) The initial response to non-operational core support systems
2	Incident Response	Critical Continuity Response	On demand	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. HIGH LEVEL CRITICALITY: (1) Immediate restoration is required (2) Maximum outage/downtime is between # and # hrs/mins/sec before impact to human life occurs. MEDIUM LEVEL CRITICALITY: (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. LOW LEVEL CRITICALITY: (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.	(1) The process of taking action to prevent the failure of a system;
3	Incident Response	Recovery Response	On demand	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.	(1) The process of recovering from a disruption;
4	Incident Response Subsystem	Priority	Continuous "inner loop"	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.	(1) Continuously monitor technological systems for signs of an incident; (2) The processes of predicting and responding to incidents.

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.	(1) The "change management" process by which we direct our adaptation to new states of the environment (the real world community);
				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.	
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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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-

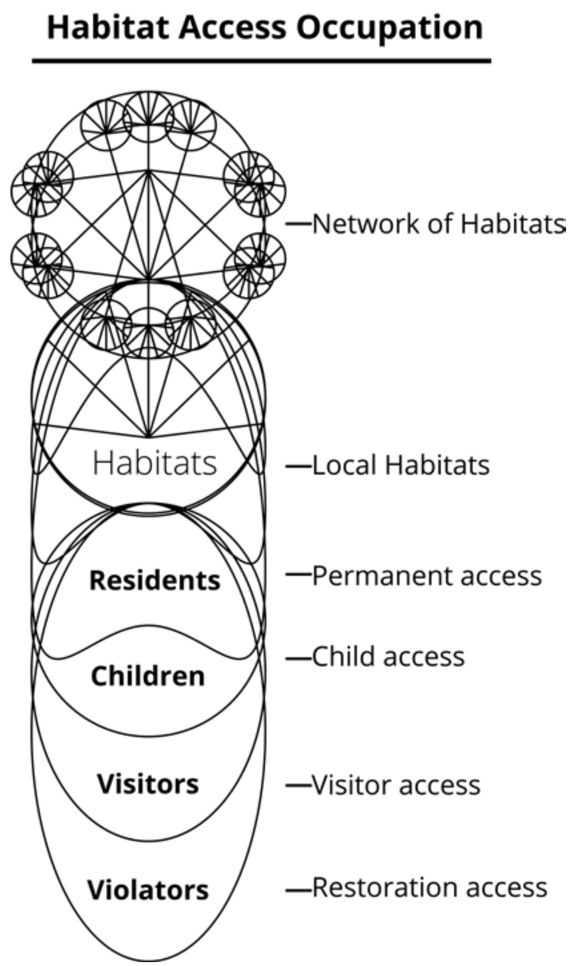

Figure 29. *The four forms of habitat access occupation.*

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?

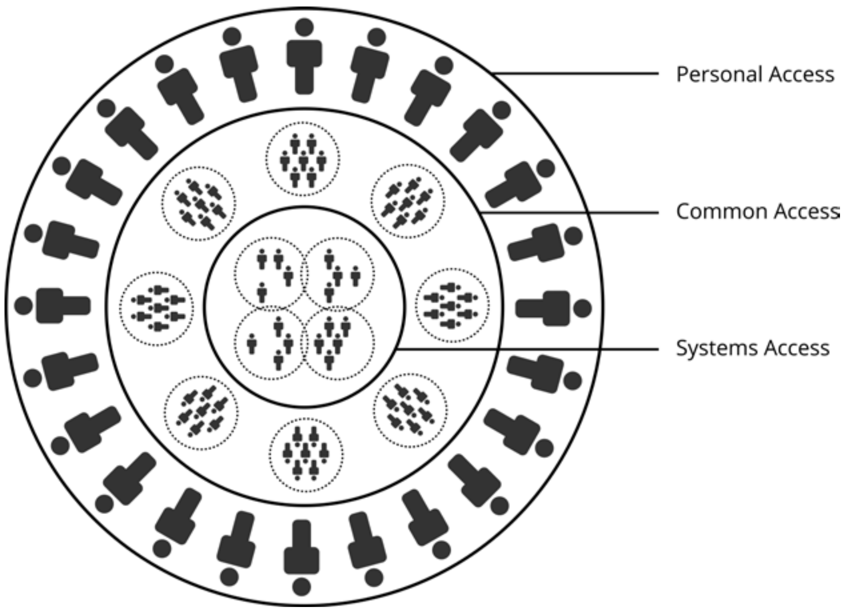

Figure 30. *The three forms of access Personal, Community, and Systems Access.*

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.

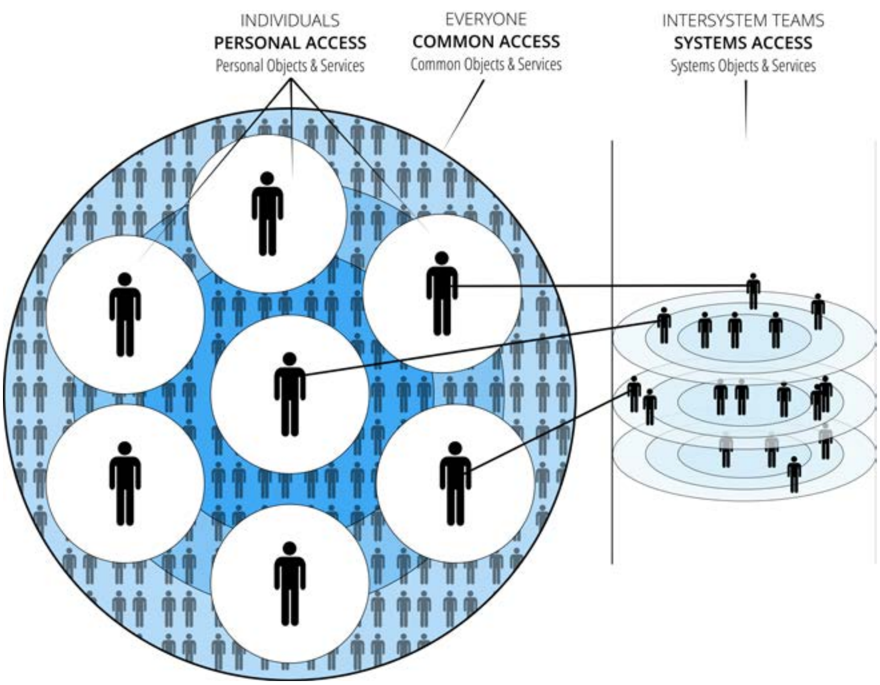

Figure 31. *The three forms of access designation in a community-type society are InterSystems access, common access, and personal access.*

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.

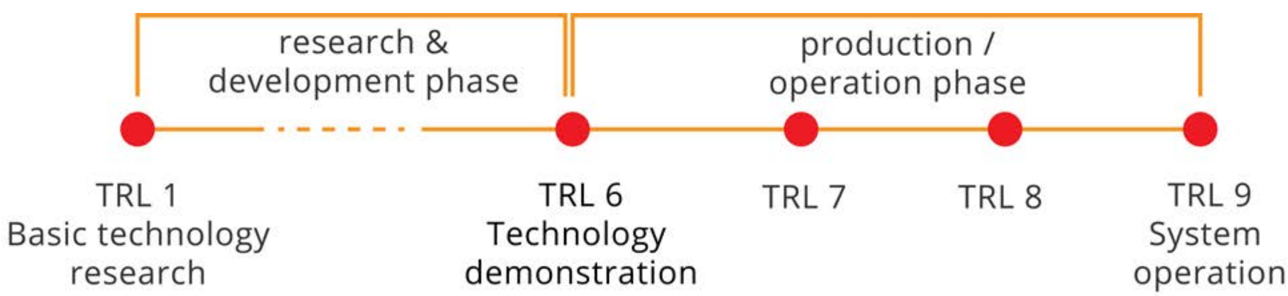

Figure 32. *Technology readiness level production/operation phase.*

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

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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?

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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.

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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	