Chapter 15

The Industrial Government

Modern politics is business politics...This is true both of foreign and domestic policy. Legislation, police surveillance, the administration of justice, the military and diplomatic service, all are chiefly concerned with business relations, pecuniary interests, and they have little more than an incidental bearing on other human interests.

Thorstein Veblen [Veb78, p. 269]

15.1 Political vs. Technical Governance

The nature and unfolding of the politically driven model of representative democracy, legislation creation and the sanctioned enforcement of law, are all borne out of natural tendencies inherent to the act of commerce and trade, operating within a scarcity-driven social order.

The development of this commercial regulation and the rationale behind the very existence of "state governance" is quite easy to trace historically. After the Neolithic revolution, humanity's once nomadic patterns shifted toward a new propensity to farm, settle and create towns. Specialization flourished and trade was hence inevitable. However, given the possibility for imbalance and dispute, as regional populations grew and regional resources often became more scarce, a security and regulatory practice manifested to protect a community's land, property, trade integrity and the like.

The use of an "army", which is sanctioned to protect by public decree, became standardized, along with an adjacent legal or regulatory authority complex, sanctioned to essentially give power to a set group of officials which facilitate such policy creation, enforcement, trials, punishment practices and the like.

This is mentioned here as there are many schools of economic thought in the early 21st century that talk about reducing or even removing the state apparatus entirely, falsely assuming the state itself is a separate entity and the starting point of blame for current societal woes or economic inefficiencies. Yet, on the other side of the debate spectrum is a general cry for increased state regulation of the market to ensure more limits on business manipulation and hence work to avoid what has been often perceived as "crony capitalism".[1] The truth of the matter is that this polarizing, false duality between the "state" and the "market" is blind to the

[1] "Crony Capitalism" is defined as "A description of capitalist society as being based on the close relationships between businessmen and the state. Instead of success being determined by a free market and the rule of law, the success of a business is dependent on the favoritism that is shown to it by the ruling government in the form of tax breaks, government grants and other incentives." [Inva] It is important to note that TZM does not believe in this distinction as it falsely assumes such collusion is avoidable.

true root cause of what is actually causing problems, not realizing that the dyad of state and market synergy is, in reality, a single power system in play, at once.

Irrespective of the merit of any specific argument as to the favoring of the "free market" vs. the favoring of "state regulation", all business dealings have historically required some level of legal mediation. This is because all transactions are a form of competition and all competition invites the possibility of fraud or abuse, given the natural pressure of external circumstances and the nature of survival itself, within the bounds of the scarcity-based market. The fact is, any form of commerce that exists in this scarcity-reinforced worldview, will manifest so-called "corrupt" or dishonest behavior constantly. It is firmly incentivized. The degree of corruption itself even becomes a matter of opinion, in fact. The line between accepted business acumen and blatant dishonest persuasion is not an easy distinction to make today in the broad view.

Therefore, some type of overriding decision-making power has always been granted to some group body to mediate conflicts and this is the seed of governmental power, as we know it. Yet, the punch line of the whole circumstance is that in a world where everything is powered by money; in a world where, in truth, everything is for sale, the rapid "corruption" of any such regulation or power establishment is also essentially guaranteed over time, to one degree or another.[2]

Put another way, there will always be a need for legal regulation of transactions in the market by some publicly sanctioned institution, and the market ethic will always corrupt such regulation to some extent with the influence of money because money and business are actually what make the world move. This is simply what is to be expected when the entire psychological foundation of existence is based on survival through acts of competitive self-interest, oriented by the universal assumption of empirical scarcity, with no real structural safeguards given to members of society for some reassurance in survival. To think any regulatory agency would not be susceptible to such corruption; to think state policy and hence coercion could not be 'purchased' like any other commodity is to deny the basic philosophical foundation inherent to the market's notion of "freedom" itself.

Therefore, complaining about state regulation or lack thereof is ultimately a moot issue in the broad scheme of long-term societal change. True social change will not come about by the illusive preference of one of these over the other. It will only come about by installing a completely different system which eliminates both the market and the state as we know it, elevating the entire framework out of the narrow, competitive focus of managing scarcity in the current "earn a living or suffer" system, to a focus on facilitating a sustainable abundance and the meeting of human needs directly.

So, the following economic and management information presents a vast departure from the current, day-to-day unfolding of life as we know it when it comes to commerce and social management. What this model does is literally remove the edifice of representative government and replace it with a kind of participatory democracy. This participation is mediated through digital communication methods that can bring the interests of the whole community into calculation, whether dealing with interests of the so-called "public" sector or the "private" sector. In actuality, there is no difference in the process of participation and hence there would no longer be a public or private sector.

The importance of this kind of management resides in several areas. For one it assures that human social operation is in accord with basic sustainability principles needed to operate with generational longevity, whilst also maintaining a vigilant focus on producing the most strategically necessary goods at the peak technical capacity known at the time of production. Such management is also about removing the vast incentive and requirement for corruption

[2] Corporate Lobbying, which is legal across the world, is a perfect example. This is legal because commercial institutions are the backbone of economic development. Government gains income from taxation and the level of gain coming from that taxation is directly tied to the businesses that hire people and sell goods. Therefore, it is only natural to assume they should have input in political decisions, at least in theory. Yet, the moral hazard is obvious since their input will inevitably work to serve their business interests. Civil government is, in truth, business government [Ope].

and corrupt behaviors, abuse and business/government collusion which has plagued civilization since antiquity. The active pursuit of abundance through these sustainable means ensures not only survival and efficiency, but stability, ease and a higher state of public health on a vast scale.

15.2 Economic Model Defined

An economic model is a theoretical construct representing component processes by a set of variables or functions, describing the logical relationships between them. If one has studied traditional or market-based economic modeling, a great deal of time is often spent on things such as price trends, behavioral patterns, inflation, the labor market, currency fluctuations, and so forth.

Rarely, if ever, is anything said about public or ecological health. Why? – Because the market is life-blind and decoupled from the actual science of life support and sustainability. It is a proxy system that is based only around the act of exchange and exchange preferences.

Therefore, the best way to think about a NLRBE is not in the traditional terms of any form of market-oriented economic model common today. Rather, this model can best be thought about as an *advanced production, distribution and management system*, which is democratically engaged by the public, through a kind of "participatory economics".

This type of approach facilitates input processes, such as design proposals and demand assessment, while also filtering all actions through what we could call *sustainability* and *efficiency* protocols. These protocols are the basic rules of industrial action set by natural law, not human opinion. As noted, neither of these two interests is structurally inherent in the capitalist model.

15.3 Goals, Myths and Overview

All economic systems have structural goals and often times these goals are not exactly apparent in the theories set forward in principle. The market system and a NLRBE have very different structural goals.

- Market capitalism's structural goal is growth and maintaining rates of consumption high enough to keep enough people employed at any given time. Likewise, employment itself requires a culture of real or perceived inefficiency and that often means the preservation of scarcity in one form or another.
- A NLRBE's goal is to optimize technical efficiency and create the highest level of abundance possible, within the bounds of Earthly sustainability, seeking to meet human needs directly.

That noted, there are a number of assumptions, myths and confusions that have arisen over time that are worth addressing upfront. The first is the idea that this model is "centrally planned". What this assumes, based on historical precedent, is that an elite group of people will make the economic decisions for the society.

A NLRBE is not centrally planned. It is a Collaborative Design System (CDS). It is based entirely upon public interaction, facilitated by programmed, open-access systems, that enable a constant, dynamic feedback exchange that can literally allow for the input of the public on any given industrial matter, whether personal or social.

Given this, another outcry is "but who programs the system?", which once again assumes that an elitist interest could exist behind the mediating software programs themselves (as will be expanded upon more so in this essay). The answer, as odd as it may sound, is everyone and no one. The tangible rules of the laws of nature, as they apply to environmental sustainability and engineering efficiency, are an objective frame of reference. The nuances may change to some degree over time, but the general principles of efficiency and sustainability remain, as they have been deduced by basic physics, along with several thousand years of recorded history by which we have been able to recognize basic, yet critical patterns in nature.

Moreover, the actual programming utilized by this interactive system would be available in an open source platform for public input and review. In fact, the system is predicated entirely upon the intelligence of the “group mind” and the open source/open access sharing virtue will help bring all viable interests to the surface for public consideration, in an absolutely transparent manner.

Another confusion surrounds a concept that has, to many, become, the defining difference between capitalism and most all other historically proposed social models. That has to do with whether the “means of production” is privately owned or not. In short, the means of production refers to the non-human assets that create goods, such as machinery, tools, factories, offices and the like. In capitalism, the *capitalist* owns the means of production, by historical definition.

There has been an ongoing argument for a century that any system that does not have its means of production owned as a form of private property, using currency as the information mechanism, is not going to be as economically efficient as one that does. This, as the argument goes, is because of the use of the price mechanism.[3]

Price, to its credit, has the ability to create exchange value amongst virtually any set of goods due to its divisibility. This creates a feedback mechanism that connects the entire market system in a certain, narrow way. Price, property and money work together to translate subjective demand preferences into semi-objective exchange values. The notion of “semi” is employed here because it is a culturally relative measure only, absent almost every factor that gives true technical quality to a given material, good or process.

Arguably, the only tangible technical data price that embodies, crudely, relates to a resource’s 'scarcity' and the 'labor energy/complexity' put into the creation of a given good. Keep this in mind, as these two value variables will also be addressed again later in this essay with respect to non-price oriented calculation.

That all noted, the reasonable question becomes: is it possible to create a system that can more efficiently facilitate feedback with respect to consumer preference, demand, labor value and resource or component scarcity, without the price system, subjective property values or market exchange? The answer is yes. The modern solution is to completely eliminate exchange and create a direct control and feedback link between the consumer and the means of production itself. The consumer actually becomes part of the means of production and the industrial complex as a whole becomes a tool that is accessed by the public, at will, to generate goods.

To illustrate this, most today likely own a simple paper printer connected to a home computer. When a file is sent to print from the computer, the user is in control of a miniature version of a means of production. Likewise, in some cities today, there are now 3D printing labs, where people in the community can send their 3D design and use these machines to print what they need in physical form. The model being presented here is a similar idea. The next step in this scaling process is the creation of a strategically automated industrial complex, localized as much as possible, which is designed to produce, through automated means, the average of everything any given region has found demand for. As will be described, this is very feasible given the current state of technology and the ephemeralization trends at hand.

Imagine, for example, a clothing store except that is not organized like a "store" as is currently understood. It is a multi-purpose textile-printing house. You find the design you are interested in online, along with the materials you prefer and other customizations, and you print that article of clothing “on-demand” at that facility. Consider for a moment how much storage space, transport energy, and overrun waste is eliminated by this approach if virtually everything could be created on-demand, done by automated systems which can continually produce a greater variety of goods, from increasingly smaller manufacturing configurations.

[3] This objection is common to the Austrian school of economics [vM20].

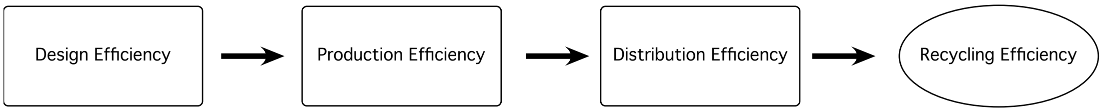

Figure 15.1 | Block-scheme of a system process.

In truth, the real fallacy of this "private ownership of the means of production" objection is its culture lag. Today, industry is witnessing a merger of capital goods, consumer goods and labor power. Machines are taking over human labor power, becoming capital goods, while also ever reducing in size to become consumer goods. The result is an increasingly smaller and more optimized industrial complex that can do more and more with less and less.

It is also worth mentioning that labor automation is now making the historically notable 'labor theory of value' [Invb] increasingly moot as well. Today, the labor energy that goes into a given good, while still a factor for process recognition, does not have much of a quantifiable correlation anymore. Today, machines now make and design machines. While the initial creation of a machine might require a good deal of human planning and initial construction at this time, once set in motion, there is a constant decrease in that labor value transference over time.

15.4 Structure and Processes

As will be described in detail by section, figure 15.1 shows the linear schematic of the industrial process, moving from design to production to distribution and recycling. An optimization of such efficiency can be considered from a mathematical point of view, as a minimization or maximization of some functional:

$$f_{\mathrm{p}}(E_{\mathrm{design}}, E_{\mathrm{p}}, E_{\mathrm{dist}}, E_{\mathrm{r}}) \rightarrow \max$$

Because we are talking about efficiency, we can consider the problem as a maximization of the production function f_p. Table 15.1 is a table of symbols and descriptions, as will be used in the following explanations. It is important to note that not all attributes will be covered in this text. The purpose of this essay and the formulas suggested are done so to give a starting point for calculation, highlighting the most relevant, overarching attributes for consideration.

A full algorithmic calculation of this nature, taking into account all related sub-processes in real life terms would require an enormous text/programming treatment and will likely occur in a future edition of this text's appendix, as an ongoing project development.

15.5 Collaborative Design Interface

The starting point for interaction in a NLRBE is the CDI, or collaborative design interface. The CDI could abstractly be considered the "new market" or the market of ideas or designs. Design is the first step in any production interest and this interface can be engaged by a single person; it can be engaged by a team; it can be engaged by everyone. It is open source and open access and it would come in the form of an online web interface.

The notion of "market" is expressed here not to conflate the notion of trade, but rather the notion of sharing and group decision-making. As with the traditional sales market, there is a swarm type of behavior which makes decisions over time as a group whole with respect to what goods will develop (demand) and what goods will perish (lack of demand). In a certain sense, this democratic process is embraced in a NLRBE, but by different means.

Moreover, all submitted designs, in creation or deemed complete, are stored in an open access, searchable database. This database makes all designs available for others to use or build

Logic Symbol	Description
E_{design}	Design efficiency
E_{p}	Production efficiency
E_{dist}	Distribution efficiency
E_{r}	Recycling efficiency
f_{p}	Production functional
E^{i}_{design}	Design efficiency standards
t_{d}	Durability
A_{design}	Adaptivity
$g^1_{\mathrm{c}}, g^2_{\mathrm{c}}, \ldots, g^{N_{\mathrm{c}}}_{\mathrm{c}}$	Genre components
N_{c}	Minimum number of genre components
H_{l}	Human labor
A_{l}	Automated labor
f_{design}	Design efficiency functional
D_{s}	Demand splitting value
$\tilde{A}$	Flexible automation process
$\bar{A}$	Fixed automation process
C_i	ith Consumer
D_i	ith Distributor
d_{p}	Distance to production facilities
d_{dist}	Distance to distribution facilities
P_{reg}	Regenerative protocol

Table 15.1 | Logic symbols and description.

upon. In this way, it is similar to a traditional goods catalog commonly found today, except it contains digital designs that can be sent into production at any time, on demand.

This design creation and proposal system is how demand itself is assessed. Instead of traditional advertising and the unidirectional consumer good proposal system - where companies work to persuade the consumer as to what they should buy, with the public mostly going with the flow, favoring or not favoring a company's pitched good, component or feature by purchase or not - this system works in an opposite, more involved and democratic manner.

In this new, open source type design approach, the entire global community has the option of presenting ideas for everyone to see, weighing in on and building upon designs, harnessing the power of collective experience and global knowledge.

The mechanism of the CDI would come in the form of an interactive interface, such as we see commonly today with computer-aided design (CAD) or computer-aided engineering (CAE) software. In short, these programs are able to digitally create and represent any given product design, containing all information as to how it should be made in final, physical manufacturing.

As an aside, many considering the educational requirements to engage such an interface, might be concerned about use-complexity. Naturally, the more dedicated designer will develop the skills needed to whatever degree interested while, for the more casual user, different degrees of interface complexity and skill orientation can be utilized.

This more user-friendly interfacing can develop in a similar fashion to how personal computers transitioned from complex proprietary coding interfaces with manually input instructions, to the now ubiquitous, simple graphic interface icon system, which allows users to operate more intuitively. Future CAD/CAE type programs will likely evolve in the same way, making the interactive process more accessible.

In many cases, as the database is always populated with current, already existing designs, the practice will be to build upon other's work. For example, if an engineer is interested in the

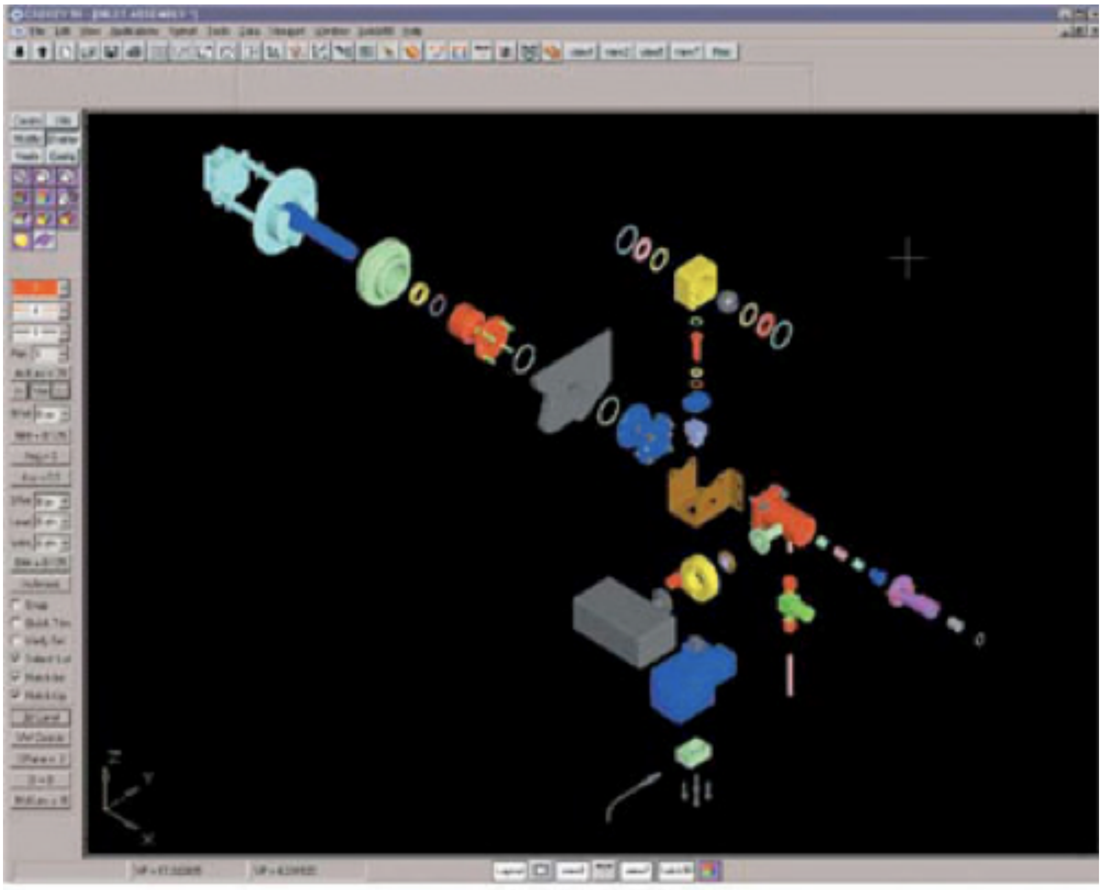

Figure 15.2 | CAD interface design example.

optimization of a cell phone, they have the option of building upon any existing phone product design in the database, rather than starting from scratch.

The benefit of this cannot be emphasized enough as a collaborative platform. Rather than limit the design input to, say, a boardroom of engineers and marketers, as is common practice today, literally millions of minds can be brought together to accelerate any given idea in this approach. This new incentive system also ensures everyone interested in the good will receive exactly what everyone else is likely to receive in its advanced optimization states, where *personal interest becomes directly tied to societal interest.*

Also, given the patterns today, likely not everyone would want or need to be a designer. Many people would be satisfied enough by what had been set in motion already by others, with perhaps minor customization along the way. Today, a very small percentage of the population actually create and engineer the dominant technology and goods we use; and this specialization may naturally continue in the future to some degree, even though it is to the advantage of everyone if more minds came together. If the educational system is orientated away from rote learning and its antiquated basis that originated in the 19th century social order, we could see an explosion of input and creativity.

All that understood, an incredibly important component of these design and engineering programs today is how they can now incorporate advanced physics and other real world, natural law properties with the proposed design for testing. In other words, the good isn't just viewable in a static visual model with noted properties, it can actually be tested right there, virtually, to a relevant degree.

For instance, all new automobile designs today, long before they are physically built, are run through complex digital testing processes that assist in design integrity greatly [Kee95]. Over time, there is no reason to believe that we will not be able to digitally represent, and set in motion for testing, most all known laws of nature, applying them in different contexts, virtually.

15.6 Optimized Efficiency Standards

Efficiency standards are standards by which a given design must conform. This evaluation will be calculated automatically, or algorithmically, by the CDS's programming. This can also be thought of as a *filtering* process.

In short, any proposed design will be digitally filtered through a series of *sustainability* and *efficiency* protocols which relate not only to the state of existing resources, but also to the current performance of the total industrial system. These would include the following "efficiency standards":[4]

1. Strategically maximized durability
2. Strategically maximized adaptability
3. Strategic standardization of genre components
4. Strategically integrated recycling conduciveness
5. Strategic conduciveness for labor automation

The Design efficiency

$$E_{\text{design}} = f_{\text{design}}(t_{\text{d}}, A_{\text{design}}, c_{\text{r}}, N_{\text{c}}, H_{\text{l}}) \tag{15.1}$$

is one of the main factors that can affect the overall efficiency of the manufacturing and distribution process. This design efficiency depends on several key factors E^i_{design}, which can be called *current efficiency standards*. Here the index i corresponds to some particular standard.

Each standard will be generally explored as follows, expanding in certain cases with respect to the symbolic logic associated, for the sake of clarity.

1. **Strategically Maximized Durability** means to make the good as strong and lasting as relevant. The materials utilized, comparatively assuming possible substitutions due to levels of scarcity or other factors, would be dynamically calculated, likely automatically by the design system, to be most conducive to an optimized durability standard. The maximization $t_{\max}$ of the durability $t_{\text{d}}(d_1, \ldots, d_n)$ can be considered as a local optimization issue. It can be analyzed by introducing the factors d_i with $i \in [1, n]$, which affect it
$$t_{\max} = \max \quad t_{\text{d}}(d_1, \ldots, d_n) = t_{\text{d}}(d^0_1, \ldots, d^0_n),$$
where the d^0_i are some optimal values of the factors.

2. **Strategically Maximized Adaptability** A_{design} means the highest state of flexibility for replacing component parts is made. In the event a component part of a good becomes defective or out of date, the design facilitates that such components are easily replaced to maximize full product life span, always avoiding the interest to replace the good as a whole.

[4] Please note these protocols were also addressed in the essay *True Economic Factors*, in the context of "microeconomic components", with mild variation in the language.

3. **Strategic Standardization of Genre Components** means all new designs either conform to or replace existing components

$$g_c^1, g_c^2, \ldots, g_c^{N_c}$$

which are either already in existence or outdated due a lack of comparative efficiency. This logic should not only apply to a given product, it should apply to the entire good genre, however possible.

The aim is to minimize the total number of genre components N_c. In other words, the standardization of the process will enable the possibility of lowering the number N_c to a possible minimum and thus reduce the number of needed genre components g_c.

4. **Recycling Conduciveness** c_r means every design must conform to the current state of regenerative possibility. The breakdown of any good must be anticipated in the initial design and allowed for in the most optimized way.

5. **Strategic Conduciveness for Labor Automation** means that the current state of optimized, automated production is also taken into account, seeking to refine the design to be most conducive to production with the least amount of complexity, human labor or monitoring. Again, we seek to simplify the way materials and production means are used so that the maximum number of goods can be produced with the least variation of materials and production equipment.

This is denoted by human labor H_l and automated labor A_l. The aim is to minimize the human interaction with the production process. This can be written as:

$$\frac{H_l}{H_l + A_l} \to \min$$

Using this equation, we could also write a simpler condition:

$$\frac{H_l(l_1, \ldots, l_n)}{A_l(l_1, \ldots, l_n)} \to \min,$$

where are factors that influence human and automatic labor.

So, returning to equation (15.1), the "Optimized Design Efficiency" function can be described by a function f_{design}, where t_d is durability, A_{design} is adaptability, c_r is recycling conduciveness, N_c is the minimum number of genre components and H_l is a human labor.

15.7 The Industrial Network

The industrial network refers to the basic network of physical facilities that are directly connected to the design and database system just described. The system connects servers, production facilities, distribution facilities and recycling facilities, see figure 15.3.

Design Servers

These computer servers connect the design database to the designers/consumers, while constantly being updated with relevant physical data to guide the process of product creation in the most optimized and sustainable way.

As noted, the engaged CDI (or collaborative design interface) is an open source program that facilitates collective, computer-aided design, running each step through the set of efficiency and sustainability filters [i.e. equation (15.1)] which assure optimized design. These designs are tested in real time, digitally, and in most cases, the good will exist in whatever state online for others to obtain, on demand, or for use as a preliminary model by which new ideas can be built upon.

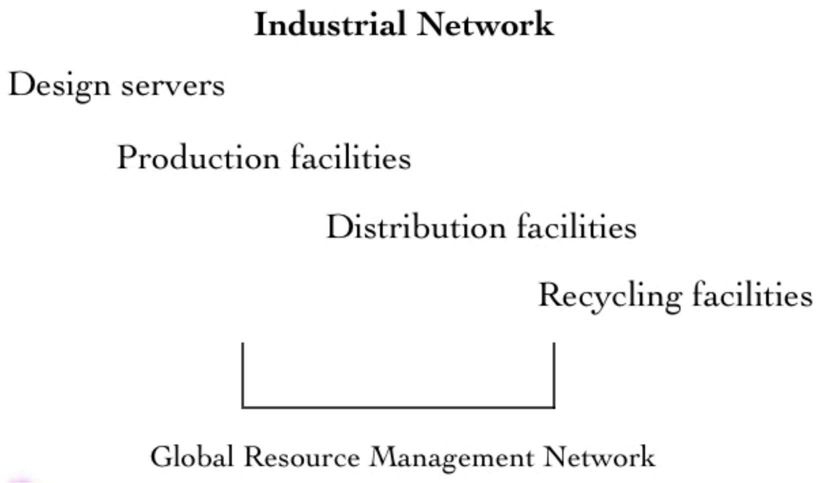

Figure 15.3 | Industrial Network visual aid.

Production Facilities

These structures facilitate the actual manufacturing of a given design. These would evolve as automated factories that increasingly are able to produce more with fewer material inputs and fewer machine configurations. Again, if the interest existed to consciously overcome unnecessary design complexities, we can further this efficiency trend with an ever-lower environmental impact and ever lower resource use per task, while maximizing our abundance producing potential.

The number of production facilities, whether homogeneous or heterogeneous, would be strategically distributed topographically based on population statistics, no different than how grocery stores today try to average distances between pockets of people around neighborhoods. This is the "proximity strategy" which will be revisited in this essay.

Distribution Facilities

Distribution can either occur directly from the production facility, usually in the case of an on-demand, one-off production for custom use, or sent to a distribution *library* for public access in masse, based on regional demand interest.

Some goods will be conducive to low demand, custom production and some will not. Food is the easiest example of a mass production necessity, while a personally tailored piece of furniture would come directly from the manufacturing facility once created.

It is worth reiterating that regardless of whether the good is classified to go to a library or directly to a user, this is still an 'access system'. In other words, at any time, the user of the custom or mass produced good can return the item for reprocessing or restocking.

Recycling Facilities

Recycling Facilities would likely exist as part of the production facility, allowing access to returned parts for updating and reprocessing. As noted in the design protocol, all goods have been pre-optimized for 'conducive recycling'. The goal here is a zero-waste economy. Whether it is a phone, a couch, a computer, a jacket, or a book, everything goes back to a recycling facility, likely the point of origin, which will directly reprocess any item as best it can.

Of course, an item may be returned elsewhere if needed; the integrated and standardized production and recycling centers, having been conceived of as a complete, compatible and holistic system, would be able to handle returned goods optimally, as is not the case today.

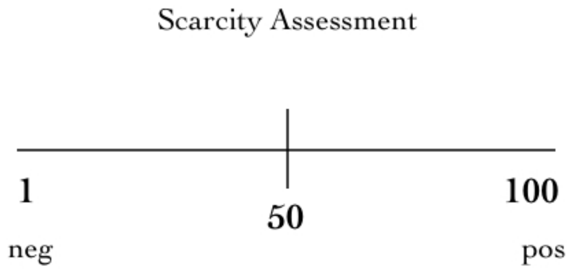

Figure 15.4 | Scarcity rank visual aid.

Global Resource and System Management

These four facilities are also connected, to one degree or another, to a *Global Resource Management* (GRM) network, which is a sensor and measurement system that provides feedback and information about the current state of raw materials and the environment.

15.8 Resource Management, Feedback and Value

As noted, this computer-aided design and engineering process does not exist in a vacuum; it does not process designs with no input as to the current state of the planet and its resources. Connected to the design process, literally built into the noted “Optimize Design Efficiency” function, is dynamic feedback from an Earth-wide accounting system that gives data about all relevant resources which pertain to all productions.

To whatever degree technically possible, all raw materials and related resources are tracked and monitored, in as close to real time as possible. This is mainly because maintaining equilibrium with the Earth’s regenerative processes, while also working strategically to maximize the use of the most abundant materials, while minimizing anything with emerging scarcity, is a critical efficiency calculation. Again, this is, in part, the purpose of the Global Resource Management system mentioned prior.

As far as “value” calculation, perhaps the two most important measures, which will undergo constant dynamic recalculation through feedback as industry unfolds, is the level of (a) ’scarcity’ and the degree of (b) ’labor complexity’.

Scarcity value

’Scarcity value’ can be assigned a numerical value, from 1-100. 1 would denote the most severe scarcity with respect to the current rate of use and 100 the least severe. 50 would be the steady-state dividing line, see figure 15.4. The scarcity value of any given resource would exist at some value along this line, dynamically updated by the Global Resource Management network.

For example, if the use of wood passes the steady state level of 50, which would mean consumption is currently surpassing the Earth’s natural regeneration rate, this would trigger a counter move of some kind, such as the process of ’material substitution’ or finding a replacement for wood in any future productions.

As far as a comparative evaluation, in a market system the price mechanism is used to decide which material is more cost efficient, assuming a given price will have already accounted for relevant technical information or, in this case, the issue of scarcity.

This new approach, rather than use price to compare or assess value, accounts for a given technical quality directly by a comparative quantification. In the case of scarcity concerns, it is best to organize genres or groups of similar use materials and quantify, to the highest degree possible, their related properties and degrees of efficiency for any given purpose. Then, a general numerical value spectrum is applied to those relationships.

For example, there is a spectrum of metals that have different efficiencies for electrical conductivity. These efficiencies can be physically quantified and then compared by value. So, if copper, a conductive metal, goes below the 50 value of equilibrium regarding its scarcity, calculations are triggered by the management program to compare the state of other conducive materials, their *scarcity level* and their *efficiency level*, preparing for substitution.

This is just one example and naturally this type of reasoning would get extremely complicated depending on the material and purpose problems posed. However, that is exactly why it is calculated by machine, not people. The human mind, either singly or organized into large groups, simply cannot process such data effectively. Also, it is worth pointing out that this type of direct value calculation, based around purpose, conduciveness and sustainability, dramatically eclipses the price mechanism when it comes to true resource awareness and intelligent resource management in calculation.

Labor complexity

Likewise, 'labor complexity' and its assessment simply means estimating the complexity of a given production and drawing a numerical value based on the degree of process complexity. Complexity, in the context of an automation-oriented industry, can be quantified by defining and comparing the number of 'process stages'. Any given good production can be foreshadowed as to how many 'stages' of production processing it will take. It can then be compared to other good productions, ideally in the same purpose genre, for a quantifiable assessment. In other words, the units of measurement are these 'stages'.

For example, a chair that can be molded in three minutes, from simple polymers in one process, will have a lower 'labor complexity' value than a chair which requires automated assembly down a more tedious production chain, with mixed materials. In the event a given process value is too complex or hence comparatively inefficient in terms of what is currently possible (by comparison to an already existing design of a similar nature), the design would be flagged and would hence need to be re-evaluated.

Such adjustments and flagging would come in the form of feedback from the design interface, during the design stage. There is also no reason not to assume that with ongoing advancement in AI, the system could actually feed back with actual suggestions or even direct solutions to a given efficiency or sustainability problem, in real time.

15.9 Design Calculation

Those generalizations noted, a walkthrough of this overall, linear process is expressed below. There will be some repetition here for the sake of clarity. If we were to look at good design in the broadest possible way with respect to industrial unfolding, we end up with about four functions or processes, each relating to the four dominant, linear stages, including design, production, distribution and recycling. Again, each of these processes is directly tied to the Global Resource Management system that provides value feedback that assists in the regulatory apparatus to ensure efficiency and sustainability.

ADDED The following propositions apply, see equation (15.1): $E_{\text{design}} = f_{\text{design}}(t_{\text{d}}, A_{\text{design}}, c_{\text{r}}, N_{\text{c}}, H_{\text{l}})$
All Product Designs must adapt to:

1. Optimized Design Efficiency
2. Optimized Production Efficiency
3. Optimized Distribution Efficiency
4. Optimized Recycling Efficiency

Optimized Design Efficiency

A product design must meet or adapt to criteria set by current efficiency standards E_{design}. The current efficiency standards have five evaluative sub-processes, as expressed before:

- Durability t_{d}
- Adaptability A_{design}
- Standardization with minimum number of genre components N_{c} *ADDED*
- Recycling Conduciveness c_{r}
- Automation Conduciveness H_{l} XXX *shouldn't it be A_l here?*

Please note that further breakdown of each of these sub-processes and logical associations can be figuratively made as well to ever-reducing minutiae. However, as noted, this expression is the "top" tier by which all other sub-processes are oriented. It is, again, not the scope of this text to provide all attributes of a working algorithm. It is also not implied here that the parameters expressed are total or absolutely complete.

Optimized Production Efficiency

The parameters of the optimized production efficiency filter, see blue box in figure 15.5, can change based on the nature of the facilities and how much machine variation in production (fixed automation vs. flexible automation)[5] is required at a given time. For the purpose of expression, two facility types will be distinguished: one for high demand or mass production and one for low demand or short-run, custom goods. Very simply, a class determination is made, see blue box in figure 15.5, which splits the destination facilities based upon the nature of production requirements D and a threshold demand D_{s} at which is decided for the product to either run in high demand/mass production ($D > D_{\mathrm{s}}$) or low demand/custom production ($D < D_{\mathrm{s}}$). The 'high demand' target, left branch in figure 15.5, assumes fixed automation $\bar{A}(a_i)$, meaning unvaried production methods ideal for high demand/mass production. The 'low demand' target, right branch in figure 15.5, uses flexible automation $\tilde{A}(t, D_c(t), a_i)$, which can do a variety of things but usually in shorter runs. XXX *ADDED* *ADDED* *ADDED* *ADDED* *ADDED*

What is t, time? What is D_c? D_i was defined as the ith distributor. What are the a_i?

Again, this schematic assumes only two types of facilities are needed. There could be more facility types based upon production factors, generating more splitting conditions. However, if the design rules are respected, there shouldn't be too much variation over time as the intent is always to reduce and simplify.

To state the process in linear form, see figure 15.5: All product designs are filtered by a [Demand Class Determination] process. The [Demand Class Determination] process filters based on the standards set for [Low Demand] or [High Demand]. All [Low Consumer Demand] product designs are to be manufactured by the [Flexible Automation] process. All [High Consumer Demand] product designs are to be manufactured by the [Fixed Automation] process. Also, both the manufacturing of [Low Consumer Demand] and [High Consumer Demand] product designs will be regionally allocated as per the [Proximity Strategy] d_{p} of the manufacturing facilities.

[5] "Fixed automation", also known as "hard automation", refers to an automated production facility in which the sequence of processing operations is fixed by the equipment configuration. It is fast but has less variation in output design capacity. Flexible automation can create more variation but the disadvantage is the time required to reprogram and change over the production equipment. These terms are common to the manufacturing and robotics industry when it comes to plant design.

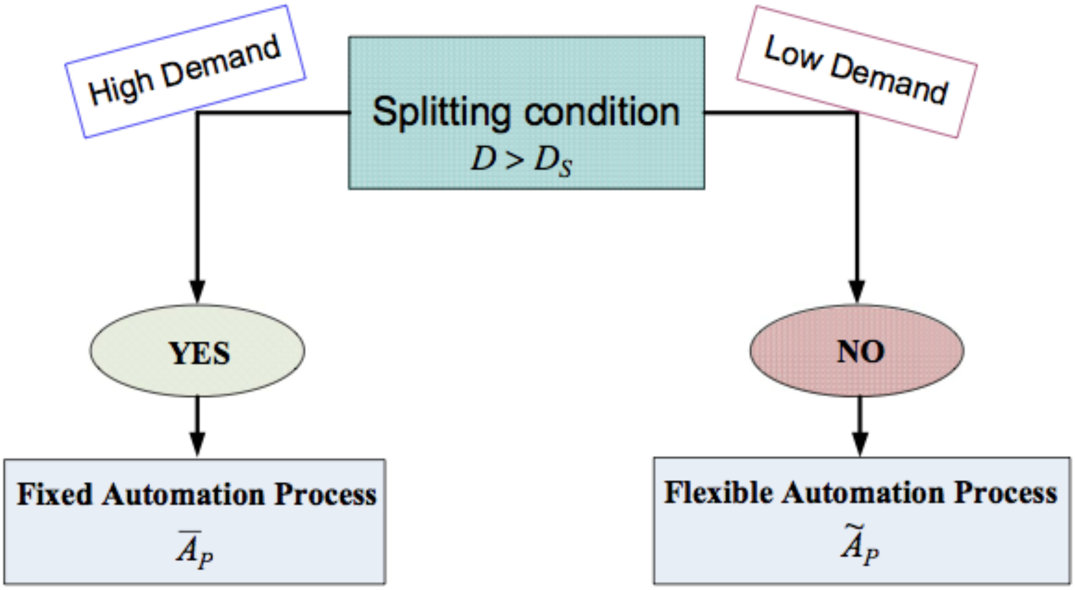

Figure 15.5 | Dividing by low and high. Application of the class determination process.

Optimized Distribution Efficiency

Once process 2 is finished, the product design becomes a 'product' and moves to the [Optimized Distribution Efficiency] filter. In short, all products are allocated based on its prior [Demand Class Determination]. [Low Consumer Demand] products follow the [Direct Distribution] process. [High Consumer Demand] productions follow the [Mass Distribution] process, which would likely be the libraries, mentioned prior. Both the [Low Consumer Demand] and [High Consumer Demand] product will be regionally allocated as per the [Proximity Strategy], as before.

In the case of [Low Consumer Demand] $D_{\rm c} < D_{\rm s}$ the distribution scheme is direct, see figure 15.6 (left). In this case the product goes directly to the consumer without the help of network intermediaries.

In the case of [High Consumer Demand] $D_{\rm c} > D_{\rm s}$ the distribution scheme is mass, see figure 15.6. In this case the product goes to intermediary distribution facilities D_i, such as libraries, to engage the potential consumers C_i.

ADDED

Similar to the production efficiency considerations, in the case of 'Distribution Efficiency' $E_{\rm dist}$,XXX for the low and high demand, the distribution process will be optimized in terms of the distance $d_{\rm dist}$ to the existing facilities. In this case the facilities are places in regional distribution (libraries), based on the level of demand in the given region, i.e. proximity strategy $d_{\rm p}$.

Why different emphasis styles? Brackets vs single quotes vs italics*?*

Optimized Recycling Efficiency

After distribution, the product then goes through its life-cycle. Once its life-cycle ends, the product becomes "void" and moves to process 4, or the [Optimized Recycling Efficiency] filter. In short, all voided products will follow the current [Regenerative Protocol] $P_{\rm reg}$. This protocol embraces the standards employed at that time to ensure the optimized reuse or reincorporation of any given good or component. Naturally, the sub-processes of this are vast and complex and it is the role of engineers, embracing natural law physics, to best understand exactly what parameters will be set.

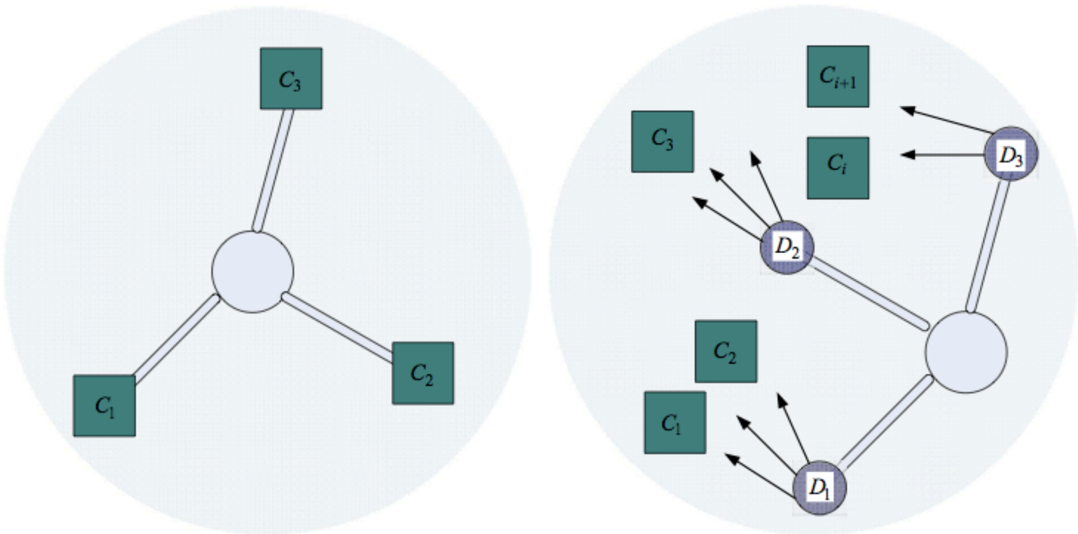

Figure 15.6 | Illustration of distribution schemes. (left) Direct distribution for low demand case. (right) Mass distribution for high demand case.