The Design

Building a Sustainable, Moneyless, Socioeconomic System

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EOS

board@technate.eu

www.eoslife.eu

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Introduction

Today's socioeconomic system has a fundamental unsustainable nature. It has a largely liner characteristic of resource acquisition, production and waste disposal. This book has the aim of presenting the top level design specification for an alternative socioeconomic system that aims to offer a good standard of living for everyone and has sustainability built in right from the start.

We start with nature and our understanding of nature. We argue that to remain sustainable any socioeconomic system must work with nature rather than going beyond what nature will allows us to do. That doesn't mean we can't break limits through greater understanding and the intelligent application of technology but it does mean that at each stage of development we do have limits and we need to remain within those limits until we have the ability to move beyond them sustainably.

We then propose a dynamic distributed socioeconomic system that has its foundations in what we have learnt from nature and through the application of such learning; understanding nature through experimentation, logic and reason forms the core of the design. The system concentrates on the management of resources on the planet and allowing people the freedom to live their own life as they wish; thus we have room for a great deal of diversity.

The system has at the core networks of sustainable communities; each like a Lego brick that we plug together with other communities to build a sustainable society. Each community manages its own waste and has the capacity to produce its own food and energy. In addition, each community has something to contribute to other communities. In doing so, each community forms part of network where, in emulation of nature, we have a symbiosis emerging from a form of reciprocal altruism; each community puts something in and gets something out. This means we have a non-nation centric system built around people and their communities, their language and culture rather than artificial national boundaries.

For the technology, we propose a system where people who have the skill and knowledge manage the technology and resources that we have. Each technical area of society takes many years to fully understand and for a person to reach a point where they can make a competent decision. Most people will have some technical skill in some areas but no one person can fully learn all that they need to learn in each technical area, therefore, a system based on expert management also leads to a distributed system where power become spread out.

The expert management of technology on the one side and the formation of communities on the other leads to a system that has a "people side" and a "technology side". Although treated as separate, both sides have overlaps and most of the people who live in the communities on the people side also work as experts on the technical side. However, experts rule in their domain and the people rule in theirs.

At the core of our current socioeconomic system lies money. Money allows us to exchange goods and services and has allowed us to advance as a species. However, our money based system also has a number of problems and has started to lead us down the path of self-destruction. It restricts people's access to needed resources, hinders some of our development, results in increased wealth concentration in the hands a small minority, enforced poverty and leads to the destruction of the environment. Not all these out comes result from intended actions; most result as a by-product or as an emergent property. In addition, to keep this system going we need ever increasing exponential growth, yet we only have a finite bases for that growth, thus our current system has a self-destructive nature as no physical system can sustain such exponential growth.

We propose an alternative; a cyclic, sustainable, money-less system that uses measures of production capacity in energy terms to allocate resources. Each citizen would have the opportunity to participate in the system and in doing so would have an allocation of the production capacity available which they can use to request goods they require. Such a system uses energy (as exergy) as an accounting unit and thus has the name Energy Accounting. The system also requires expert management to produce items sustainably.

The rest of this book presents the ideas in more detail with the intention that it should form a specification for the design of a future sustainable socioeconomic system. The core ideas of understanding nature through experimentation and the application of logic and reason remain but the implementation can take many forms. In the appendix we present one such form which aims for an evolutionary change to an alternative system (not revolutionary; we don't aim to "over throw" governments but aim to build up from the grass roots a demonstrable working system for a future sustainable socioeconomic system).

Testing, Testing, Testing

Part of building a sustainable system, testing has a central role in the design. We have a good imagination for creating artificial worlds. Testing allows us to distinguish between our imagination and reality. Thus, the central core of understanding nature works through a process of observation and experimentation and then testing the ideas. When we have something that we can show works we can add it into the system. The same goes for updating, modifying and evaluating new ideas. Through a process of testing what we have learnt we can grow sustainably.

The implementation details presented in the appendices present one way forward as well as a testing platform. We aim to test out the design and then build from what we know works. If things fail testing we examine, modify and move forward either with adaptations or new ideas. We hope other groups will also try out variations of the design present here and test out their ideas. We don't pretend to have the one and only "right" answer but instead aim to network with like minded groups who aim for the same goals as presented here but have alternatives ideas. That way if anyone of use has an idea that does not work we can learn from the others. Also, even if we do have something that works, another group may present something that works better.

Utopia

The word "utopia" can mean:

1. A designed society
2. Literally, "nowhere"
3. A perfect society

The Design, present here, forms an example of a designed society so in that sense it falls within the classification "utopia". As the word "utopia" comes from the Greek meaning "no place" or "nowhere" the design present here also forms an example of a utopia in that sense. However, the Design does not aim to represent a perfect society. We argue the design presents *better* society in terms of sustainability and life quality than today's system rather than presenting a perfect society. We still have much to learn!

Summary - an Overview of the Design

1. **Demarcation between the complex, technical aspects of society and the social side of society**. The technical side affectively forms the life support systems that keeps society running such as mining, farming, production, distribution and housing as well as health care. The social side deals with people to people interaction, ethics, morality and spirituality.

2. **Expert management of the technical side of society**. A hi-tech complicated society has many different parts which takes many years to learn and understand before a person can make a competent decision. In addition, people with little knowledge or expertise tend to have confidence in their opinions while those who understand the situation tend to have less confidence [kd1, kd2]. Therefore, the design calls for skilled experts to manage the areas that they have knowledge and expertise in rather than relying on the often erroneous opinions of people who do not understand the complexities of the different aspects of society.

3. **Direct democracy for the social side**. Not all aspects of society have the correct technical solution. We propose that people would live in communities where they would use direct democracy to manage the social side of the community.

4. **A moneyless socioeconomic system**. We propose a system of Energy Accounting as a means of managing the supply of goods within a society. In an Energy Accounting System we measure the ***production capacity*** of society in the energy terms. The people can then choose the allocation of production capacity through the allocation of energy

credits. The energy credits represents each individual share of the production capacity.

5. **A holonic socioeconomic structure**. We propose a non-nation centric structure built around communities, network of communities and projects. This would form a Lego like structure where people would work locally within their own community on various projects. Projects could link up with other projects and communities with other communities in the network that would lead to a world around system.

6. **No private ownership**. As all the means of production come under the management of experts, ownership makes no sense. Instead we would have a form of user rights. Some items such as personal items and housing would have exclusive user rights but most items people will have the right to use as they need such as ground vehicles.

7. **Environment design.** We aim to design environments not only to allow people to develop to their full potential but also to discourage aberrant behaviour [CDS].

References

[kd1] Ehrlinger, Joyce; Johnson, Kerri; Banner, Matthew; Dunning, David; Kruger, Justin (2008). "Why the unskilled are unaware: Further explorations of (absent) self-insight among the incompetent". *Organizational Behavior and Human Decision Processes* **105** (105): 98–121.

[kd2] Kruger, Justin; David Dunning (1999). "Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments". *Journal of Personality and Social Psychology* **77** (6): 1121–34.

[CDS] Oscar Newman. “Creating Defensible Space”
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Characteristics

The term *technate*, within the context of this design, refers to an *operational area* that manages the technical asspects of society. i.e. a geographical area with the following characteristics:

1. **Application of Science.** The organisation and management of the technate has its roots in science applied to society. It takes the best science and technology we have to build a sustainable socioeconomic system and adapts and changes as our knowledge changes. The technate has a pragmatic nature with decisions based on empirical findings.
2. **Expert Management.** All the technological aspects of society come under the management of those with the skill, expertise, training and education in a given technical area. This results in strict lines of demarcation, that those without the require expertise in a given technical area have no say in the decision making for that area. It also results in a distributed form of management as no one person has technical expertise in all the technical aspects of society.
3. **Authoritative not Authoritarian**. In an authoritative system experts given instructions in their area of expertise. People then follow those instructions not through force but through recognising that such instructions probably represent the optimal thing to do, people can chose not to follow the instruction. This contrast with an authoritarian system where strong leaders tell people what to do and people have to obey regardless.
4. **Goal Orientated.** The technate has a goal of maintaining the highest standard of living for the longest time possible. This means the technate has a sustainable nature. All work within the technate follows many other sub-goals but each sub-goal has compatibility with the overall goal.

5. **Openness**. Everyone has free access to information in all[1] aspects of the operation of the technate and the communities within the technate[2].
6. **Technical domain.** The technate manages the technical aspects of society (the means of production, transportation, communications, power infrastructure etc.) within a geographical area and not the people within that area.
7. **Communities and people.** The design make a distinction between those technical areas under expert management and people issues that do not have a technically correct answer (such as morality and social issues). The people aspects comes under the domain of the people who live within a given set of communities.
8. **Balance**. The technate operates in such a way as to balance the supply with demand and production with ecology to maintain a sustainable socioeconomic system.
9. **Multi-use**. The technate aims to have multiple use of items such as hall which we could use for a theatre as well as sport events or transport systems that have multiple users.
10. **Load factor**. The technate will try to maintain items usage as high as possible. Productions facility, for example, should run at about 80% of maximum load (to allow for unforeseen events).

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1 We might have to make an exception for defence related matters but as a general rule we aim to have as open a society as possible.

2 This doesn't extend to personal information associated with or identifies an individual. Personal data remains privet so long as the individual wishes it so.

Science and Engineering

Introduction

We have set a holistic goal of achieving the *highest standard of living for the longest time possible*. This leads to a requirement for a sustainable, hi-tech society. We intend to achieve this through the application of science to society. Therefore, science and engineering form the core of our proposal. Much of what we presented in our design we can change as we learn new things, experiment and test. However, the core of science applied to society remains. This chapter aims to give an overview of science and engineering.

Science

The term "*science*" comes from the Latin word "*scientia*", which means "knowledge" and it refers to both a body of knowledge and to a method for achieving knowledge. Science effectively forms a way of understanding **nature** and describing how **nature** works.

The scientific method has developed as a way of exploring nature. The scientific method begins with experience and observations of nature. Scientists try to explain those experiences and observations. Normally, they have a set of explanations which they aim to test out. We call these explanations *hypothesis*. These hypothesis predicts something about the natural world that we can test. We then conducted tests and experimentation to try and see if we can show of the hypothesis as false. If we fail to do that and the hypothesis stands we have a possible explanation for the natural phenomena we have observed or experienced. When we have a set of hypotheses, experimentation, observations and experiences we can grouped them all together with an overall explanation. That explanation we call a *theory*.

We do not stop there, however. We constantly test our explanations and generate new hypothesis. Over time we may change our theories. Science deals with the *most probable* explanation given the evidence that we have. The explanations follow from evidence of the natural world. As we learn more we improve our explanations.

Engineering

The word "*engineering*" has its roots back in the Latin word "*ingenium*", which literally means engine formed from the two words "*in*" and "*gigner*" meaning "to produce" or "to beget". We use the word today to refer to the **appliance of science** or practical knowledge to the construction of machines, materials, or structures.

The Appliance of Science to Society

The core idea, presented in this Design therefore, comes down to making observations of nature, experimenting and testing out ideas and then using what we have learnt to build a sustainable society.

Communities and People

The Design concentrates mainly on the technical aspects of society but not so much on people and how people will live their lives. This results from the fact that the design allows people to live their own lives and allows each community to run itself and, therefore, does not dictate any one way of living. However, the design does layout some specifications for the people side so we have a *minimum* set of common standards between communities.

Respect for others

The design allows people to live their own life and for communities to have their own culture and language and laws. However, each community has to maintain a basic set of human rights that guarantee life and liberty to each individual and the freedom of movement from a community to another. Communities have to respect other communities, given that each community can have its own culture this may lead to communities disagreeing with the way other communities operate.

However, so long as such communities stay within the bounds of a basic set of human rights each community (or groups of) have no say in other communities and thus have to tolerate the others and in turn others have to tolerate them; the design does not tolerate intolerance.

Governance

Communities can link up with other communities as they wish forming larger legislative councils and such councils can cooperate to form a confederation.

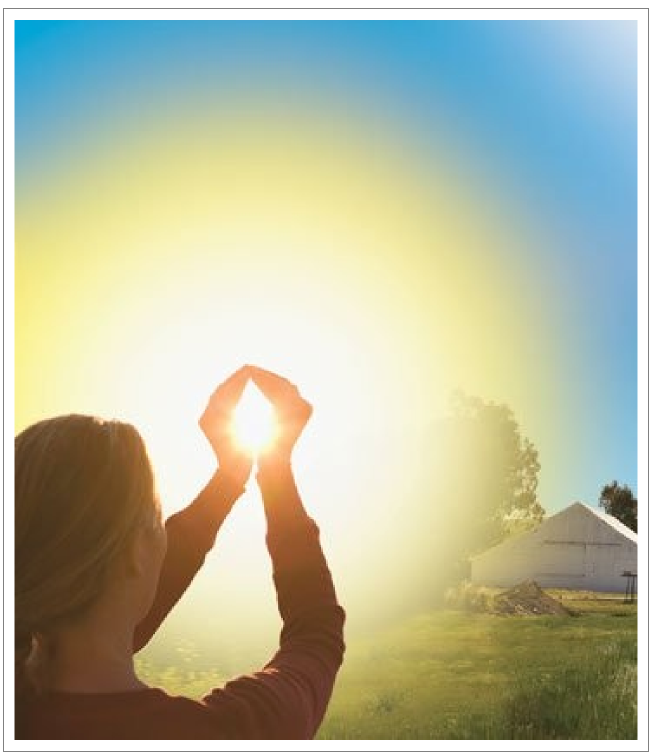
For governance, the Design recommends a form of direct democracy where the people elect a legislative council to draw up laws that the people then vote on. The people can also vote to overturn a law. The Design allows for other forms of government if the people within each community wants it, such as a consensus form of government. Each legislative council acts as the authority within the domain of its own communities but has no say in the affairs of other communities **nor in the technical management of resources** within a community.

Confederalism, Democracy and Technocracy

Introduction

EOS is proposing a future administrational structure governed through a technocracy characterised by functional sequences (informational nodes and channels) and holons (autonomous organisations).

This structure would be producing and conducting services after the wishes of each and every citizen through Energy Accounting. It would be kept in check by the merit that no one person controls more than her own area of expertise and function, thus creating a complex web without any clear command centre.



That is how we intend to manage the resources, the production, the distribution and the recycling.

Now we should discuss how we intend to manage the people.

Technocracy vs Democracy

The Design doesn't discuss how people should live their lives within society. We do not hold an ideal of how people should chose to behave, act and work in our society. We do not discuss what laws the technate is going to enact. We do not discuss how we should police the technate.

The reason is simple: the technate is by no means supposed to be a state. Rather, it is supposed to be a service, responsible to provide the people of the Earth with the highest possible quality of life for the longest possible span of time.

Hence, that we technocrats do not by any reason implicate that we want to abolish the constitutional arrangements structuring the European states or the US, for example, although content certainly has to change in order for the people to be able to install the technate.

If the European people, for example, want it, they could keep their traditional nation-states within the technate, and govern the laws regulating social life and laws (and other issues not under the sphere of the technate) under their customs, for example parliamentarism in Britain combined with a constitutional monarchy, or a republic in France.

To the technate, it is not relevant what flag a European country choses to have, what language its people is speaking, or whether or not people should eat meat, go out and drink late, or what things people are watching on TV. We are not interested in acquiring the power of legislation. That is a matter which we leave to other authorities, under the condition that they – like the technate under this hypothetical condition – would have the support from the citizens of Europe.

In conclusion: Technocracy and Democracy could co-exist and prosper alongside each-other, as their areas of responsibility does not collide or contradict each-other. The technate would administrate that aspect of the World which today only is indirectly regulated by nation states, namely the aspect which consists of extraction, production, distribution and recycling of goods and services.

Confederalism

When the Design talks about confederalism, we mean an emulation on the holonic system on a World political scale. It is not something which we actively intend to shape, with or without the consent of the people, but yet again something which the people must urge the decision-makers to enact.

The technate in itself could only provide quality of life as a service. It could not and should not try to supplant the civil society. But a flourishing civil society alongside the technate, unrestrained by the limiting effects of the price system, would be able to create one more culturally and emotionally diverse than ever before – in short, something resembling a golden age of culture.

Thus, an empowered civil society would act as an ideal partner to a technate. While our current national states are based around and founded around the needs of a system vastly different to that system which the Design is proposing, a civil society in a confederate shape would empower the people as a partner to the technate.

What kind of World would be ideal to cooperate with the technate on the perspective of a constitutional framework?

We are thinking of a World which is consisting of one or several confederacies of municipalities, reminiscent of the Swiss cantons. This confederalism will be based upon an open entry, and would be open to communities across the world to partake in, no matter colour, language or location.

What is the legitimacy of democracy? Democracy is derived from the Greek words ”demos” (people) and ”kratoi” (rule). Hence, democracy per definition means that the people are in control of their own destiny, through law-making.

Our thought, is that these municipalities, which would consist this highest political authority in this technate, would base their authority on direct democracy. In short, the people would vote on the laws themselves, directly and without an interlayer of elected representatives on the municipal level. The municipalities would elect representatives to be sent to the confederate level which the people themselves might decide the limitations of.

How many confederacies could the World sustain under the technate?

In short, if people wish, they could turn their existing national states into confederacies of municipalities, and even create more supranational systems above the confederate level. But the centre of this proposed mechanism will always be the municipalities, and the power will lie there.

The reason why is that the more decentralised the political system is, the more autonomy for each individual. Your influence is proportionally more strong if you vote on an issue or a person whom you want to represent you in an area comprising 200 or 2000 people, than in an area composing 200 million people.

There is also a biological reason why people would probably prefer such a constitutional system. We must remind ourselves that humanity for most of its existence has been consisting of hunter-gatherer communities numbering up to 200 individuals[1][2]. All species have a specific number tolerance for individual recognition. In a community of millions of individuals, it is therefore a significantly higher risk that the individual would feel alienated and without control of her own destiny.

Therefore, with power channelled into groups which are of moderate size, the influence of each and every constituent rises. As the constituents also will be responsible for legislation, the amount of democracy will both proportionally and substantially increase under such a confederalist system.

Limitations

What would the limitations be?

The first limitation would be human rights. A basic contract or constitution should be in place to secure that the communities may not violate basic human rights. They may not discriminate people on the basis of gender, ethnicity, faith or disabilities. They may not create laws which are inhumane or violating the rights of people to their opinions, their personal integrity, their ability to utilise their energy credits or their right to move.

The second limitation would be that the communities will not administrate the continental infrastructure, which will be operated through the service of the technate. The technate is governed not through direct voting. People will not vote over what is going to be produced, but decides it by the allocation of their energy credits. No individual could decide where anyone else is going to allocate their energy credits.

Conclusion

It should stand clear that the Design is predominantly concerned with the technate as an alternative to the socioeconomic system which we have today, and that we do not wish to institute any kind of political system above the heads of the people. But, a political system built on the form of confederalism outlined in this chapter would be beneficial as it will easily cope with the technate.

In the proto-technate, the communities which we are going to establish as experimental hubs are going to employ a system to administrate the non-technical non-distributive aspects of their existence through a similar direct democratic system as outlined in this article.

References

[1] http://www.liv.ac.uk/researchintelligence/issue17/brainteaser.html visited 2011

[2] http://www.cracked.com/article_14990_what-monkeysphere.html visited 2011

Education

Introduction

Education forms an important part of the technate and provides a lifelong environment for learning. Everyone should have the opportunity to learn, develop and advance and the education system should offer facilities for anyone to learn whatever they wish and to learn at their own rate.

Functions

The education system would have the following functions:

- **Cultural**

The education system should have a cultural aspect. This overlaps with the people side as different communities or groups of communities can have their own culture the exact content of the cultural aspect can differ from community to community. However, the cultural aspect should not deny any person access to any part of the education system.

- **Innovation**

The system should encourage creativity and questioning in such a way as to encourage new ideas.

- **Political**

The education system should also teach how the technate works and why.

- **Selection**

The education system should provide opportunities for students to explore various subjects and to then continue in subjects of interest to them.

Allowing the students to build up the expertise and knowledge needed to contribute to the operations of the technate in a given functional area.

Path Through the System

Rather than following age or gender the education system should follow competence and ability and allow students to learn at their own rate. So, we would have the education system built up on blocks as each student pass through each block they can move on to other blocks. Some of the earlier blocks would follow a linear path where students would learn basic and general skills but later blocks would allow students to follow different parallel paths and to change from path to path as they choose. Student would also have the opportunity to redo paths if they need to.

Best Practice

The education system should use the best practices known to encourage critical thinking, logic, mathematics and an understanding of science and art. It should also aim to teach skills necessary for the technate and to teach people how to learn so they can learn for themselves. The education should also have a high degree of practical application and the technate should aim to establish facilities such a laboratories for learning as well as using what resources the technate might have available.

The education system should use projects and assignments as a preferred means of demonstrating a person’s learning and abilities.

The system should have a structure and have goals to achieve but each individual should have the freedom to advance at their own rate.

The education system should aim to teach morality and cooperation at an early age.

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Sustainability

Abstract

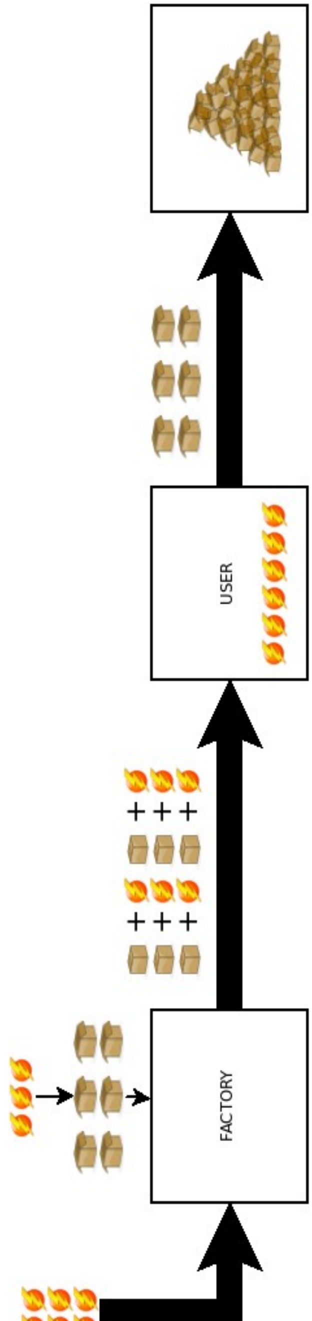
To aid understanding of the concept of Sustainability, this article presents a series of diagrams, a theoretical background, examples and engineering guidelines. Sustainability as the scientific approach to production, which understands the variables of its environment rather than simply exploiting it. Offers a fresh perspective on the design of systems of production, which are better able to serve their purpose and are more economical on the long run. Sustainability is a necessity as well as a logical next step.

Introduction

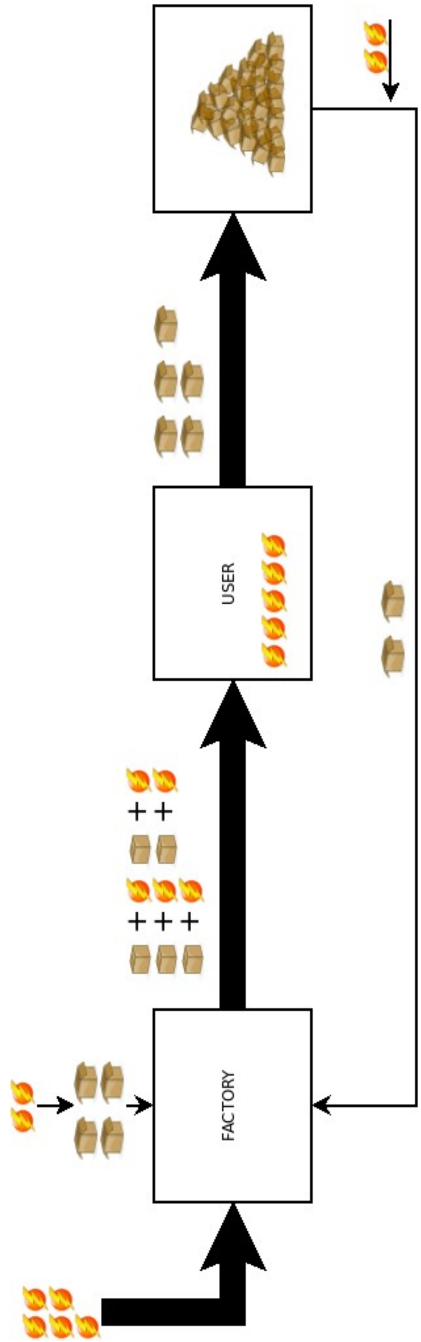
Though Sustainability is a relatively well accepted concept[1], it is often understood as simply spending more on recycling or reducing demand until the criteria are met. As such it is not difficult to understand why many people do not find it a particularly exciting prospect[2]. But we find it not only necessary but also inspirational. In this article I will try to explain why this is so. To us, Sustainability is more than simply criteria to be met. Sustainability is a philosophy[3], a way of designing whole systems of production, a system with powerful advantages[4], with primarily only design costs.

Part 1 - Concept diagrams

First let's quickly overview the past to help us understand the terms. The idea is to deliver energy to the end users. This energy (lightning icons) may take the form of foods and fuels, as well as tools and other general purposeful things. Typically energy cannot be used in its original form and has to be converted by packaging it in something. These packages (closed packet icons plus lightning icons) are the products we use and using them spends the energy contained within them, leaving the package used to deliver it behind (open packet icons). This simplified explanation describes a system that is both essential and characteristic of many forms of life, though in the case of humans it is also present in the technological production and consumption system. Its purpose is letting us survive in a varied environment.



Old capitalist system of production



Modern capitalist system of production

For example, in order to survive we require energy that originally comes from the sun. Plants package this energy into complex organic molecules[5], which we eat, releasing the energy and producing waste[6]. This works in another scenario as well, for example if we require hammers. Energy goes into the production of hammers, which we then use until they are rendered useless in effect spending some of the energy put into constructing them, at this point they become waste.

Unsustainable systems

Above is a schematic of an old capitalist system of production.

The process is divided into simpler tasks, done by different groups of people. The "FACTORY" in this case takes energy from a source, and produces the required packages[7], while the "USER" is the end user that opens the packages, uses the energy. The old capitalist system of production does not take care of recycling, hence the empty containers of energy and piled up on garbage dumps[8]. This is a textbook example of an unsustainable system, but is still widely used for most products.

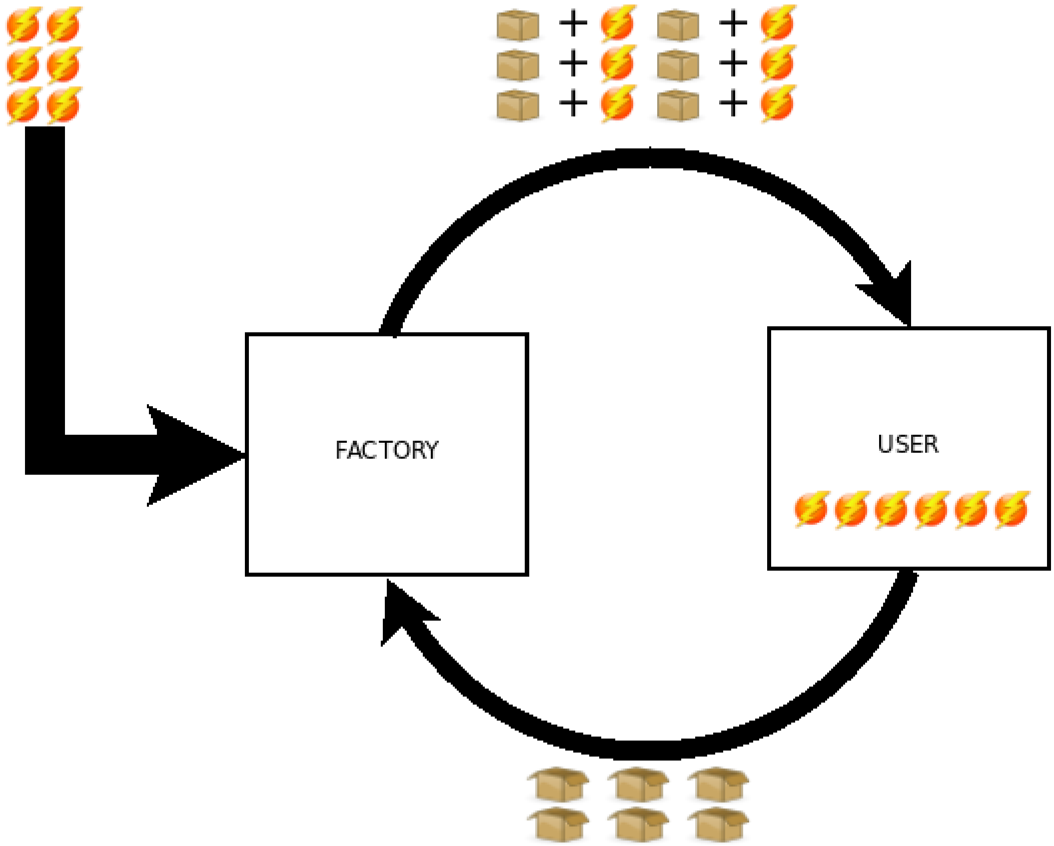
Unsustainable systems with recycling

However, as people slowly ran out of places to put the garbage, the idea of recycling has become more popular. Hence the modern capitalist system of production.

Some of the energy from the environment is not packaged and is instead used to recycle some of the used containers. However this is seen as reducing the amount of energy available to the end user and is hence unpopular in systems with high demand for energy. A limit is typically maintained on the amount of energy spend for recycling, which keeps the system unsustainable.[9]

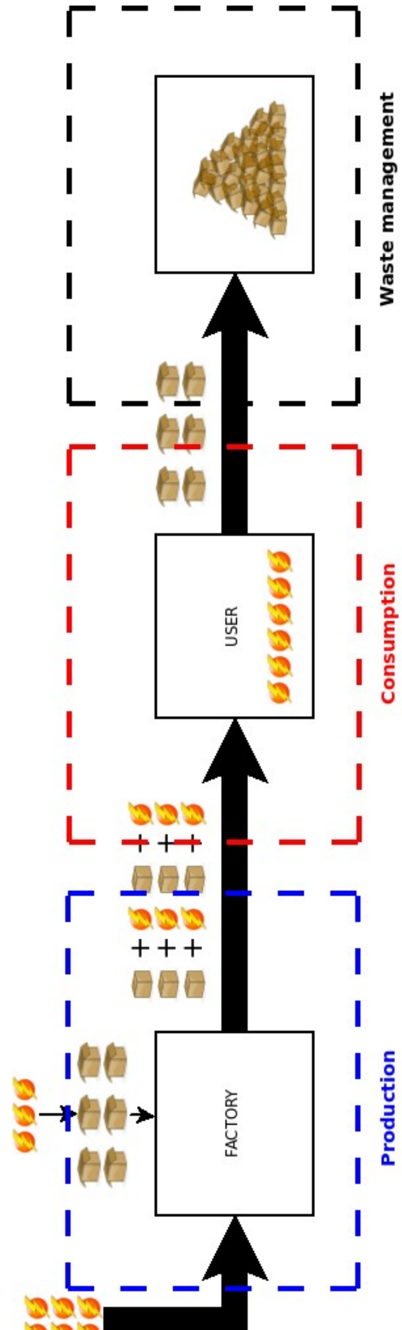
Sustainable systems

What we need is a fresh start. Here is a diagram of a technocratic system of production:



Technocratic system of production

Here the train of thought changes. We no longer have a linear progression of energy --> FACTORY -->package --> USER --> waste, instead we have a cycle where all we do is deliver the energy to the end user ("USER") and have our factory take care of its delivery. The "FACTORY" has changed role from an energy converting service into an energy delivery service. The significance of the new view is in the design of such systems. In order to be able to construct a working "FACTORY" we must ensure that it's inputs are available and that it's outputs are usable. In a capitalistic system of production, we could easily design a factory that is not sustainable, so long as an energy source and end user was available. In the technocratic view this is however no longer possible as the "FACTORY's" main function is now also to reuse the empty containers, the cycle must be complete for such a factory to be able to exist.



Old capitalist system of production is typically broken down

Part 2 - Understanding the diagrams

The significance of the new model is in the different way of thinking involved in it.

To better understand the difference between them, it is important to appreciate the thought process involved in working with each of them in reality.

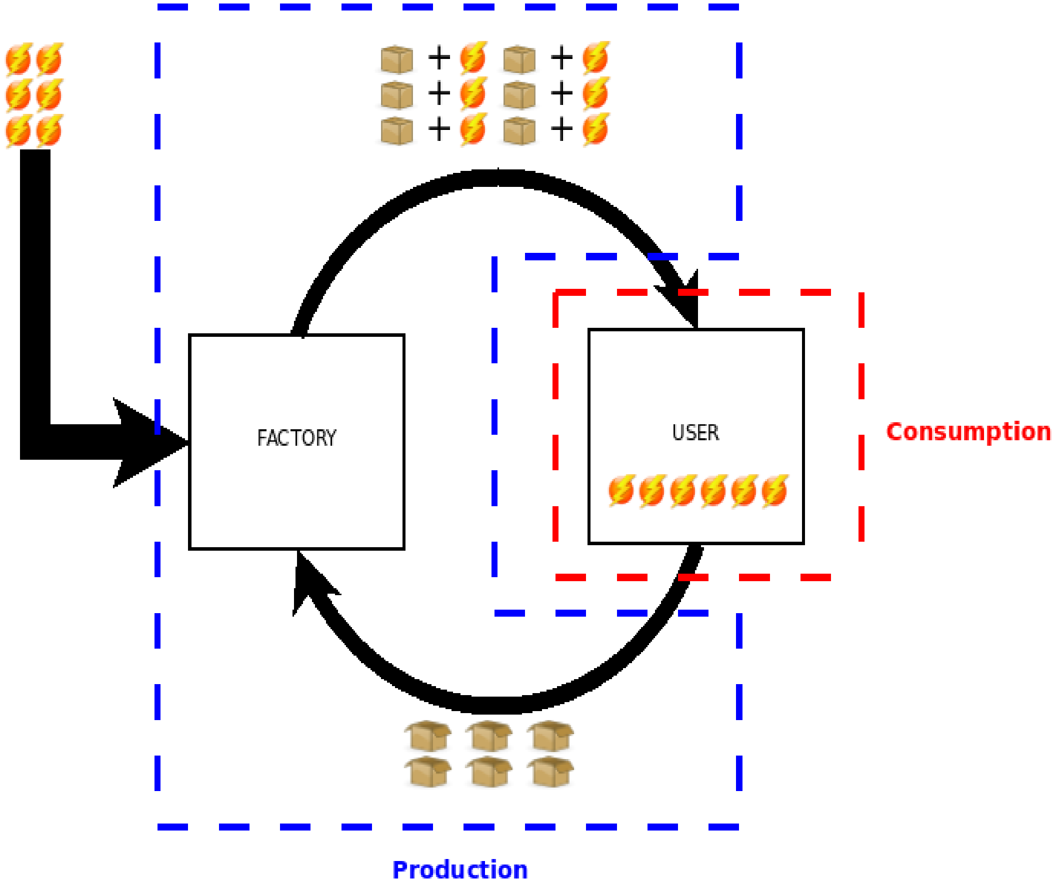
Unsustainable systems

In implementation, the old capitalist system of production is typically broken down in the above diagram.

These separate frames are typically designed and managed by different people and may therefore grow or shrink independently of each other, despite being tied together. In a world where the consumption frame has grown dramatically[10], while the production frame has been keeping up with relatively good success, the waste management has been lagging behind, unable to handle the increasing amounts of waste[11]. It has become an undesired element of discussion when considering the potentials for economic growth; is often considered to be the limiting factor and is therefore often being neglected or ignored. The problem in this view is that all it takes to create an imbalance which results in the ecological problems we face today, is to be ignorant of other people's problems, and this is simply too easy.

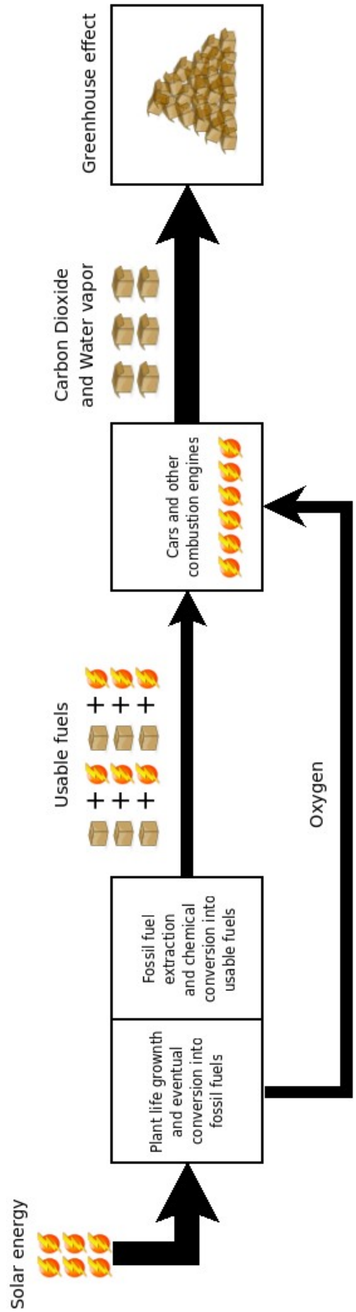
Sustainable systems

Take a look how with a different perspective, things begin to change:



A different perspective

Here the roles have changed somewhat. To the consumer little has changed, but it is now part of the design of the production environment to take care of supplying the consumer with content, and simply cycle the products that contain it. Like in the old approach, the energy requirements of the consumers are satisfied and held back by the capacity of the production environment, but since now the task of the production is no longer to simply stack consumers up with products, but instead to cycle the containers using which the production delivers energy, food, usefulness, entertainment (etc) to the consumers, the growth of the production no longer corresponds with ecological and sustainability problems. In fact, so long as the production is properly designed according to this way of thinking, this is never a problem.



Fossil fuels

Part 3 - Examples

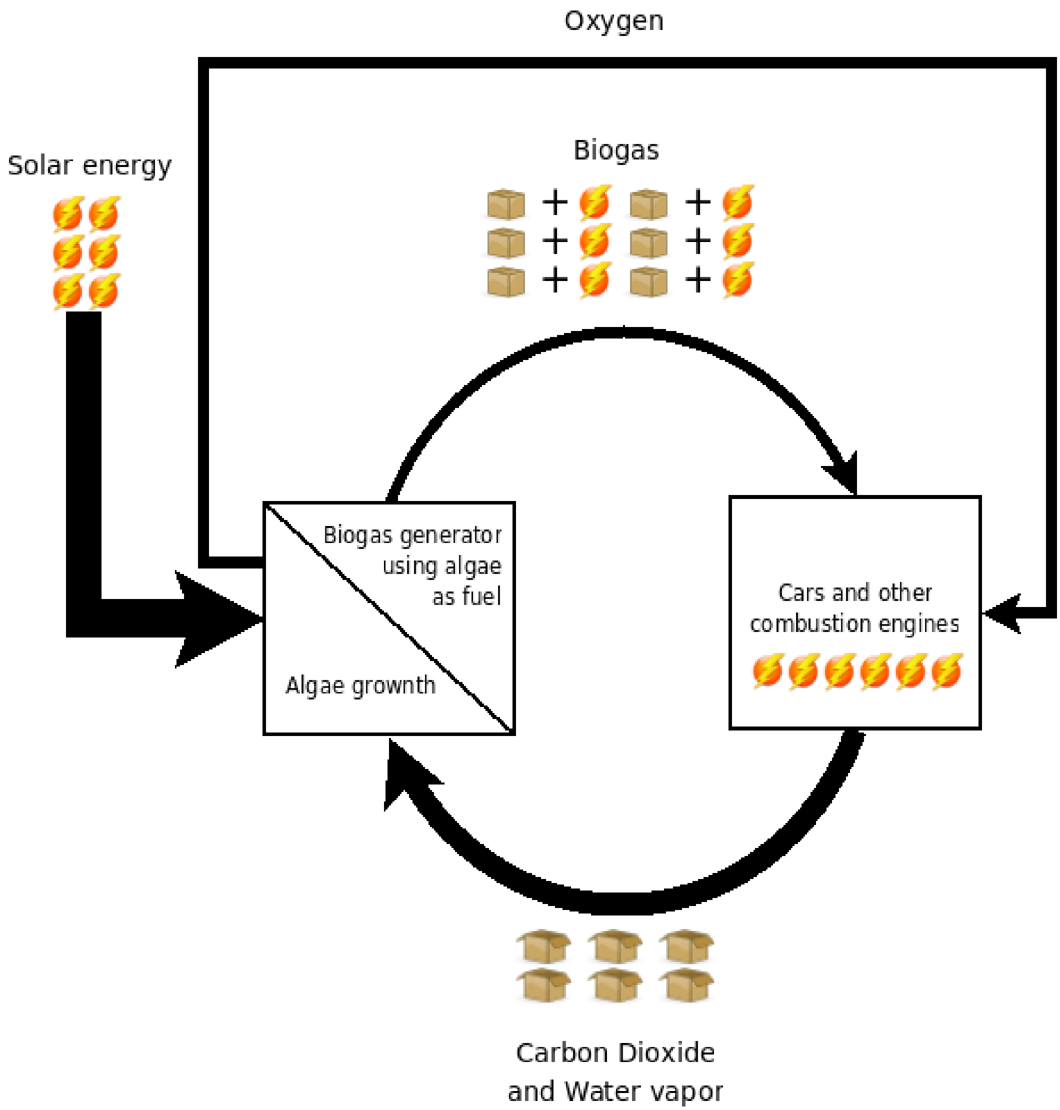
Fossil fuels

One of the most obvious examples of the difference between sustainability and unsustainability is the energy development industry. This is what we most commonly understand under the word "Sustainability", we tend to think of solar cells and wind turbines as technologies for sustainable energy development and fossil fuel technologies as examples of unsustainable ones. However this is not entirely true, for with proper system design, fossil fuel technologies may also be used for sustainable energy development! Let us take a look at some examples how.

In a typical approach, fossil fuel technology relies on there being fossil fuels in the ground, which were produced by a chemical conversion[12] of buried plant life[13] tens of thousands of years ago. They thus proceed by extracting these fossil fuels from the ground as a form of production, which are then burned with atmospheric oxygen within our vehicles and power plants as a form of consumption, resulting in waste carbon dioxide and water in the form of vapour released into the atmosphere[14]. Fossil fuel technologies are widely popular for the high energy density of the products accessible (5,139.5 kJ/mol for gasoline)[15] to the consumers and ease of use.

This is obviously an unsustainable design, as eventually we will run out of fossil fuels[16] and atmospheric oxygen, and saturate our atmosphere with too much waste carbon dioxide[14] for us to survive in. Yet the advantages of fossil fuels are there for all to see and fossil fuels at the moment are still the preferred fuel to be used in mobile energy users.

Understanding this, we have instead designed a sustainable system to replace it. Our designs suggest growing algae and using the resulting biomass in a biogas generator. This process produces biogas and the growing algae release oxygen into the atmosphere. The biogas can then be burned in vehicles and power plants as fuel using atmospheric oxygen as usual, releasing carbon dioxide and water in the form of vapour into the atmosphere.



Bio gas

This is a sustainable design. The generator provides a constant stream (in the long run) of biogas, the oxygen used up in burning it is replaced by the growing algae and the released carbon dioxide is actually required for growing algae[5]. Because none of these processes make or destroy matter, all the quantities add up to equal amounts, meaning that burning biogas produced in this manner does not produce any waste or require any fuels that are not already part of this system and constantly recycle, maintaining each other. Biogas also has the relatively high energy density (890 kJ/mol)[17] and is very simple to use like fossil fuels, by burning. If this were to be in widespread use, minimal alterations would have to be made to the vehicles currently in use[18].

Our designs were made with sustainability in mind. This system isn't simply another technology, it's the same technology used differently. Biogas generators have been in use for years in different areas of fossil fuel use and waste recycling[19]. What is different about our design is that the original intention was not how to produce more fuels or recycle more wastes, it was how do we deliver the same advantages of fossil fuels to the consumer without a catch. And this is also the point of the Sustainable philosophy, you do not provide products, you provide advantages.

Record industry

Similar improvements could be apparent in other industries, resulting from the different way of thinking during the design of their systems of production. Take the record industry for example, currently this is an industry challenged with technology of the day, where their main area is stacking up their customers with optical media (CDs and DVDs) which are now obsolete and provide their customers with no obvious advantage, given other technologies of the day. If the record industry had planned with Sustainability in mind their purpose would instead be delivering multimedia content to the consumers, rather than discs. If this were the case one would assume they would have come up with the idea of using a communications network for the purpose a long time ago.

Serving drinks

For a most down to earth example of the differences in thinking, let's look at the area of serving drinks automatically. The vending machines in use for this purpose today offer your drink in a colourfully printed single-use can or single-use thin plastic cup, convincing you to drink it with large advertisements. This is because from the provider's point of view, the point is in selling as many as possible and all comfort and ecological concerns are secondary to that. In a Sustainable design, the industry's focus would be on supplying the consumers with drinks, rather than selling them as many cans as possible. In this approach attention could shift to providing better drinks and comfort of use (drinks could be served in comfortable reusable mugs rather than single use cups), advantages good for the consumer, rather than colourful cans and advertising, which offer no advantage for the consumer. The reasons for this are: Firstly, the provider will be encouraged to look for cheaper ways to deliver drinks with minimal overhead, secondly the provider littering the consumer's living space will not seem acceptable to the consumer, thirdly the consumer's right to interact with the provider will not abruptly end on purchasing a product as the sold will be a service rather than an individual product.

It is noteworthy that Sustainability, in this case, also has clear advantages for the provider. The drop off of sales here is an illusion, as it is realistically very unlikely the consumers will ever buy more drinks than they desire simply due to being tricked into it. Sustainability ensures more permanent and reliable consumer relationships, which provide a dependable stream of income.

Part 4 - Sustainable design

Ultimately the place where the change in way of thinking makes the biggest difference is in the mind of the engineer responsible for designing these systems of production. Here are some recommendations:

- **Always keep up to date with newer technologies and obtain general understanding of the natural processes that can complement your production process to make it sustainable.** Detailed understanding is not required for the educated guess expected of you, yet basic understanding will allow you to see solutions to systemic problems you may have thought unsolvable (e.g. How to provide a sustainable option for a reliable source of electricity).
- **When doing feasibility studies, always consider and emphasize the sustainable option.** Your costumer is relying on your expertise to

provide solutions that are best for them and sustainability is excellent for all of us.

- **Sustainable solutions guarantee investment return.** Be sure to mention that. Unsustainable solutions may seem cheaper on the short term, but will always have poorer investment return than sustainable solutions. An unsustainable solution has limited lifetime and often maintenance costs that depend on the market situation (cost of oil, electricity), while a sustainable solution is capable of generating a constant stream of return forever and maintain itself by design.
- **It is always possible to obtain a sufficient loan**, to cover your initial investment. Sustainability is the smart option. It will pay out on the long run.

Conclusion

By properly understanding what Sustainability really means, we have moved the term away from being an expensive buzzword of the modern world. We have shown that Sustainability is in fact something that makes sense both in the engineering and economic sense. It is something that is good both for the industry as for the consumers. We have shown that Sustainability is not another nonsensical drain on your money that you are forced into by the ecologists, instead by taking it into account early enough into the design of the facilities of production, you can use it to increase your long term returns and lower the risks involved.

Eventually, all of our systems will have to be Sustainable if we want to survive. However, it is important that we start now. Sustainable solutions may not remove the environmental damage we have already caused, but they will begin to remove the cause, before the effects become too taxing. By starting to design systems with Sustainability in mind now, we allow us the chance of a smooth transition from exploiting our environment, to using it intelligently. There is nothing to lose.

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Energy Accounting

The subject of this chapter is energy accounting and its intentions are to offer a comprehensive description of the economic distribution system in the technate, it's differences from the price system and the different aspects of its parts. Due to a lack of literature covering the basic parts of technocracy, there was and still is a profound need for articles further investigating energy accounting as well as other aspects of technocratic design.

Scarcity and Abundance

Before we start investigating energy accounting, we must understand its premises. The foundation of mainstream economics consists of five postulates, based around a theory that all resources are finite or "scarce", while human will to consume them is infinite. This theory is largely unsubstantiated, but without it, it would have been impossible for economists to calculate anything.

Technocrats, on the other hand, recognise that while it is indeed a profound fact that scarcity could exist and that a price system under such conditions is one type of solution to that problem, there does exist situations where abundance could arise. Of course, our premise is different than that of economists.

Instead of assuming that human want is infinite (one could very well still do it), and thus make scarcity inevitable, we stress the fact that human ability to consume is limited to the conditions of his/her body. Human wants might be infinite, but the human ability to fulfil these wants is very finite. We are not proposing a counter-postulate of "inevitable abundance", but rather putting forward a more in-depth analysis of scarcity and abundance.

Abundance arises when an infrastructural system is able to meet the human capacity of consumption while human labour input in the consumption-generating sectors (agriculture, industrial production and so forth) is diminishing. This process is usually a result of technological progress. The problems with abundance is twofold. Firstly, it makes it harder to calculate prices. Secondly, it leads (under a total free market economy with minimal interventionism) to prices which are diminished to the point where the producers cannot simply uphold their production.

The Price System or "Exchange Accounting"

The price system could also be called "exchange accounting", since all systems involving "exchange" of goods and services, from primitive barter systems and gift economics, to the advanced globalised economy which we have today, are based upon prices which are adjusted according to supply and demand.

If we assume two Egyptian subjects 4 000 years ago, we could construct a hypothetical price system not involving monetary exchange units. We say that the first of the peasants, A, desires a good, x, which the other peasant, B, is in possession of. A, in his/her turn, is in possession of an unspecified number of goods y, which B is desiring.

In this hypothesis, the price will be in correlation of the point where each of the persons involved in the exchange finds it suitable to trade. We assume that both wants the good which the other one possess, and that they will exchange quantities of goods to the point where each of them is satisfied. The exchange doesn't need to be equal, since the deal would be subject to the individual demand of each person involved in the exchange.

More recently, money was started to being used, because it simplified exchange and made it more socially secure to trade, due to the fact that money A) is not a good of sustenance, and B) is permanent in nature. The value represented by money is of course also dependent on its relative scarcity in relation to the amount of goods and actors involved in the given market.

The problems with exchange accounting are many. Now we should not discuss barter, since it would be by all definitions impossible to uphold a modern technological system with advanced factories and an advanced, integrated infrastructure through barter. Instead, we should focus on the problems with monetary exchange.

Money is possible to accumulate. That is a function of its role as a good which is not used for anything else than exchange. Of course, this is not a problem, since it allows capital investments and economic growth, making technological progress more easy. At the same time, it is encouraging inequalities which have created income disparities where four fifths of a given national population in a developed country has access to 20% of the national resources, while the one fifth left would have access to 80% of the resources.

That represents an inefficiency, because the ability to consume is thwarted by the bottlenecks known as the ownership privileges in access to the means of production granted to the social groups with most accumulated capital.

Moreover, exchange accounting requires everyone to participate in the process of production, whether as an investor or as an employee. Under a process of automatisation, a lot of workplaces are disappearing. Historically speaking, new workplaces have often been created. Industry supplemented agriculture when the efficiency of agriculture led to lower employment in that area, and the service sector is today supplementing industry in most developed nations, something which the original technocrats failed to predict. But as automatisation increases, job creation in the future under the price system would take more and more interventionist measures as well as intentional creation of market failures to bolster jobs, including subventions of small companies.

The greatest problem with the modern price system of exchange accounting is that it is based on eternal exponential growth in order to secure the well-

being of the citizens. Hence, environmental foot-prints and over-exploitment of natural habitats are becoming serious problems which eventually could devastate a lot of the planet's ecosystems. First, when something is made artificially scarce by the use of property rights, or naturally scarce because of exploitment, the price system could react and make it valuable.

One could of course try to impose regulations of the price systems, but problems are seldom solved at the top but rather on the bottom. Moreover, regulations are most often imposed to "solve market imperfections" which means that the state, with subsidies and taxes, are working to make the fruits of the production more scarce they are. That could hold together the price system, but at the cost of a lower standard of life and more inefficiency than needed.

We, technocrats, propose an alternative to "exchange accounting", namely, "energy accounting". So let us look up what energy accounting is.

Energy Accounting or "The Distribution System"

To have general energy accounting imposed upon a given economy, three conditions must be met. There must be enough resource diversity to support a self-sustaining system without the need for exchanging goods and services with the rest of the world; this system must be technologically developed so it can utilise its resources more efficiently than any existing competitor; it would need to have personnel properly educated in managing the system at its disposal. Without these three preconditions fulfilled, a technate cannot be established. Of course, energy accounting would, in a partial, primitive version, be existent in a proto-technate (an expanding network of eco-units run by technocratic principles).

Energy accounting is not based upon the buying or selling of goods and services on a free market. Instead, it is based on interaction between the production system in its whole and the individual consumer. It is not based upon the exchange of property either, since the resources at hand for each individual would not change with transfers of the energy units to the technate.

First, according to the traditional technocratic design, every individual is granted an equal share of access to the production capacity of the technate. This division of access is made according to a very simple equation. The entire production capacity of the technate during a given period (which must be determinable in length), is divided according to the number of users the technate has. Thus, no individual and no groups of individuals would "own" the means of production in themselves, but the fruits of the production capacity would be under usership of the individuals who are users of the technate. These usership rights could neither be sold, bought or compromised except for in cases of emigration.

The usership rights do not correspond to "real resources" but rather to the production of consumer items and services. Hence, cars, computers and other machinery is accounted for as parts of the technate. The cost of using them is corresponding to the energy usage.

The usership rights is a part of the social contract which is the technate. It is physically manifested through an energy credits. The available capacity is divided into energy units, which could also be called energy credits, although it might be misleading. Why? Because the units, since they most correspond to the available consumption capacity in the technate during a given time period (minus, of course, the usage during a given period), would not be possible to save over that period. Instead, the certificate will be recharged with a new share corresponding to the new total production capacity of the technate.

Energy units could not be transferred between individuals.

When an individual is using his/her energy credits, the energy units correspondent to the energy cost in production are derived from his/her credits for the remainder of the time period. Yet, after usage, the energy

units cease to exist. They are only in function so that the technate should be able to track demand and adapt the production after the desires of the users. It is thus neither a planned economy nor a market economy, but an *interactive economy*. The individual is the sovereign over her share of the production capacity.

How does energy accounting affect the socio-economic situation of the individual?

Since the technate isn't a price system and is self-sustaining, it does not have any profit incentives, or any incentives to tax its users. Neither any affiliated democratic bodies, whether in the form of traditional nation-states which are members of the technate, or autonomous direct-democratic communes would have any incentives or *opportunities* to tax the individual.

I
income with 25-50%.

There would be no more debts, since costs are determined for usage and not for the acquisition of property. Hence, young people and couples would never need to be compelled to fear for the future because of debts over education and housing.

The technate, being self-sustainable and in abundance, would provide all of its users with free healthcare, education, elderly-care and travelling.

Last but not least, since the technate would have full overview over its resource usage and will always manage to adapt production to consumption, it could also compensate the environment a lot better. With higher energy efficiency and better usage of resources, people could always be certain that efficiency increases in environmental sustainability also would increase their standard of life.

Potential Drawbacks

Even if the social contract of the technate states that its users, voluntarily accepting the "Social contract of the third Millennium", would work a minimum amount of hours within the technate, thus reducing the overall work-hours, the lack of monetary income could potentially lead to efficiency losses and environmental degradation due to insufficient motivation of the personnel. This could be partially solved by instituting a reward system, make the distribution system semi-flat instead of completely flat or to make all jobs more enjoyable by the elimination of monotonous, uninspiring tasks.

Also, if that is not the case, the lack of exclusive property rights could lead to abuse of technology and environment, thus creating a quality of products below sustenance for the users (tragedy of the commons). Some personal responsibility is thus most likely needed.

Transitory Phase

We must remember that energy accounting is a system which has never been empirically tried out within an acceptable context. Therefore, we could today never be certain what effects it would have and how it will affect the socio-economic situation in the World. As scientists, we must be given opportunity to test out the system and remedy some of the unintentional ills it may put over the World, before aiming to unleash it fully. Even if energy accounting in its present form proves to be sufficient, it would still be a hazardous process to implement it before testing it out first.

One arena to test it out might be in the form of a proto-technate, namely a network of inter-changing eco-cooperatives aiming to become both automated and self-sufficient.

We would also need a new form of calculation software as well as an own internal computer network to handle distribution. One could expect that the experimental forms of energy accounting at the beginning will only take care of very simple tasks, before upgrading by experience and natural evolution.

Still, it stands quite clear that we are in desperate need of an alternative to an current economic system which cannot stop its own self-suffocation. Energy accounting as a theory is more developed than ParEcon or time-unit accounting, and less based on "human nature". In fact, people may be as selfish and greedy as possible, and yet, energy accounting would offer a compelling alternative to the current state for them.

Energy Accounting Design

This chapter outlines the design specification for an Energy Accounting system.

Introduction

The current socioeconomic system uses a debt based monetary system to enable people to purchase goods. This system has a number of problems with it; it results in a small percentage of the population controlling most of the resources of the planet [UN_WIDER], it creates poverty and starvation, and it has a fundamental unsustainable nature to it. Thus, we propose an alternative system based on the energy it takes to produce goods within the system. Our proposal starts from the fact that the production of goods forms an example of a physical resource allocation system and as such requires energy to run. The energy available places a limit of what the system can do. This chapter has the following layout: First, the chapter presents the science behind the design; thermodynamics, then the application of thermodynamics to economics. The next section looks at the economic system as a resource allocation system. The final part then presents a design for an alternative, sustainable, system at the level of a macro-economic model.

Thermodynamics

The term **thermodynamics** refers to the science of energy exchange between two systems that result in a temperature change. The term **heat** refers to this energy transfer. Scientists largely developed the science of thermodynamics during the 19th and 20th centuries where they developed three laws of thermodynamics (which has since had the addition of a fourth "zeroth law").

Zeroth Law of Thermodynamics

This law deals with systems in balance. When two systems reach thermal equilibrium they have the same temperature. Example of this include taking some one's temperature when the thermometer comes into thermal equilibrium with the person thus indicating the person's body temperature.

First Law of Thermodynamics

The first law deals with the conservation of energy. In a thermodynamic system energy flows into or out of a system as heat causing and change in the internal energy of the system and / or work. So, what you get out equals what you put in; only the form of the energy changes.

$$\delta U = \delta Q - \delta W$$

Where U stands for the internal energy of the system, Q for the energy added to the system as heat and W for the work done. Thus, we can account for all energy entering or leaving the system.

In a thermodynamic system, every event that occurs as a *change of energy*.

Second Law of Thermodynamics

The second law of thermodynamics deals with the quality of energy. The first law says that we can change energy from one form to another. The second law puts limits on this change. We can only change energy from higher quality to lower quality. Or:

The system progresses from a state of order to a state of disorder as entropy increase.

$$\delta S = \frac{\delta Q}{T}$$

Where S = entropy and Q = heat added and T = temperature.

This also means that as we convert one form of energy to another we encounter losses in the system and the available work decreases.

Entropy can decrease on a local level but for the system, when including the environment, the overall entropy increases.

Third Law of Thermodynamics

The third law deals with systems that approach absolute zero.

> *As a system approaches absolute zero, motion approaches zero and entropy approaches minimum.*

Exergy

The term "exergy" refers to the usable energy for a physical system and follows from the second law of thermodynamics; we cannot full change heat to work. Energy comes in different forms such as potential, chemical, kinetic and electrical energy. Not all forms of energy have the same potential to produce work. We can convert electrical energy completely to work but cannot convert heat energy fully to work [Wall].

As any socioeconomic system requires energy to work we can measure how much available energy (as exergy) we have and that will give us a measure of the system's ability to produce.

A socioeconomic system not only needs energy but also materials. We can also use exergy as a measure of materials. This follows from the materials having a chemical potential. Thus, the exergy, Ex, we have becomes:

$$Ex = U - U_{eq} + P_0(V - V_{eq}) - T_0(S - S_{eq}) - \Sigma_i \mu_{i0}(n_i - n_{ieq})$$

Where U stands for the heat in the system, P the pressure, V the volume, T the temperature, S the entropy and ≑ the internal chemical energy. In addition, information can also have an exergy value. This follow from the application of statistical mechanics and information theory where we can define a particle as have one bit of information.

$$Ex = kT_0 I$$

As we can use exergy to measure usable energy, materials and information that a socioeconomic system utilises, exergy, therefore, forms a *common accountancy unit* for any socioeconomic system.

Exergy has an additional property of use for a socioeconomic system; exergy has a relationship to the environment. The greater the difference a system exhibits between itself and the surrounding environment the greater the exergy becomes. Thus ice in the tropics has a higher exergy value than ice in the Arctic. Heating has a higher exergy cost in the winter than in the summer [Wall].

As exergy forms a common accountancy unit and has a relationship to the environment we can use exergy as a control variable for a resource allocation system such as a socioeconomic system.

The Thermodynamic Interpretation of Economics

The term **Thermoeconomics** refers to an economic theory resulting from the application the laws of thermodynamics to economics, especially the second law.[1] Early work on the subject starts with Frederick Soddy's "Wealth, Virtual Wealth and Debt" (George Allen & Unwin 1926), but the term originates with the American engineer Myron Tribus in 1962,[2][3][4] and developed through the work of the statistician and economist Nicholas Georgescu-Roegen.[5]

A Thermoeconomic Theory of Value

As the second law of thermodynamics and information theory have a link we can also see thermoeconomics as statistical physics of economic value.[6]

$$V(X) = \sum_{i=1}^{n} p_i \left(-\log_{\mathrm{b}} p\right)$$

Where V(X) represents the value of product X. The positive integer, b, represents the number of producers and p the probability measure. This leads to products with a high number of producers having low value and a products with a low number of producers having a high value. A value of P = 1 represents a state of abundance and the value of a product equals zero.

Production and Competition

Thermoeconomics models systems as acquiring low entropy from the environment and forming structure. In economics these structures form business and products which compete with each other. In thermoeconomic terms this process becomes:

$$\frac{dS}{S} = rdt + \sigma dz$$

Where the entropy, S represents the economic value and r the rate of price change over time. Sigma represents the rate of uncertainty.

Production has associated fixed costs and variable cost, both connected with entropy. In thermoeconomics the cost becomes:

$$C = SN(d_1) - Ke^{-rt}N(d_2)$$

$$d_1 = \frac{ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{ln\left(\frac{S}{K}\right) + \left(r - \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

Where N(x) represents the cumulative probability distribution function for a standard normal random variable. The variable K represents the variable costs.

A Distributed Resources Allocation System

A socioeconomic system based on exergy becomes a resources allocation system where we could have a system that uses state variables to control the system. The system would use exergy to measure the production cost of an item so each item produced would have a cost that reflects the physical cost of that item rather than a subjective monetary value. A society would also have a certain amount of exergy available for the production of each item and the processes that go into maintaining and running society.

A hi-tech society consists of people who require goods. Production faculties produce these goods using resources, such as ores extracted from the ground or food crops grown on farms. This system requires energy to function. Therefore, we can define an Energy Accounting system as a resources allocation system consisting of a tuple Ra(R, E, P, G, H) where:

- *R(x: is a resource)*
- *E (x: x is an exergy producer),*
- *P(x: x is a production facility),*

- *G(x: x is an item) and*
- *H(x: x is a person)*

The problem then becomes one of allocation R(r) and E(e) to P(p) to produce G(g) and allocating G(g) to person H(h).

Where *D* represents the demand and *M* the manufacturing capacity.

The resource allocation problem then becomes one of allocating exergy to production based on the user initiated demand for goods and the maintenance requirements of the system. We could do this through calculating how much exergy we would have available for the system, within a given time period, as a whole allocate x amount for the system maintenance and large common projects then distribute the remainder equally among the user base as "Energy Credits" (EC). The ECs effectively *represent* **production capacity** and the users can then allocate EC to production to acquire personal items.

The elements of this system have different geographical locations. The resources tend to have locations different to the major cities which form the location for most of the people which can differ again form the production facilities. Thus, raw materials require transporting to production facilities and good require transportation to the people. Thus, the system has the essential characteristics of a distributed system. Scientists have conducted much research into distributed resource allocation systems.

This system does not fall into the classification of a planned economy as people, h, drives the goods production and resource allocation so the system instead forms an example of a demand driven system. However, demands often follow patterns which can mean some planning can take place within the system. For example, the system tends to experience a rise in demands of seasonal goods around certain seasonal festivities such as the mid-winter holidays and some goods tend to have a more or less constant demand throughout the year, such as day to day domestic goods.

Energy Accounting Design

An energy accounting system should present a means of resource accounting and allocation of production capacity to people. As all processes forming a socioeconomic system requires energy and materials to work the energy accounting system should monitor the materials and exergy available as well as demand on the system.

The production of goods has two aspects to it. The external and the internal.

1. The external aspect. The people place demands on the system for the manufacturing of goods. The people place their demands through the allocation of energy credits to the production of goods.

2. The internal aspect. Experts manage the production facilities to insure maximum utilisation of resources, the sustainability of the system and to ensure the needs of the system remain within the limits of nature and balance with those of the eco-system.

Thus, the design for the Energy Accounting System has two parts.

1. The user interface in the form of Energy Credits (EC). Each EC measures the production capacity in terms of energy (or exergy). Each citizen within a technate has an equal share of ECs allocated to them. They can then allocate their ECs to the production of *personal* goods.

2. Technical management of the system. This involves the measurement of the production capacity and materials available. The allocation of ECs to individuals as well as carefully managing the resources for production.

Energy Flow Within a Technate

The technate operates though allocating energy. What we often neglect to say is that the technate, apart from allocating a buffer of energy at the disposal of the users, also need to allocate energy to maintain the infrastructure of residential, social, recreational, industrial and sustainable infrastructure, as well as for the transport network.

We can see the energy as the "necessary energy expenses" for maintaining the technate. We could call it energy A. It shouldn't fluctuate much over time, at least not in an advanced technate, and this should form characteristics of this kind of energy.

Then, we will have the energy needed to excavate new resources, to research and to upgrade technological infrastructure. we could call it "necessary energy expenses for research and development", and its costs could fluctuate over time. We could call this type of energy B.

A+B forms basically the needed energy usage for the operation of the technate itself, and this energy should form a distinct set separate from that which is allocated to the users.

Now we come to the energy share which the system allocates to the users, namely C. Bear in mind that we do not locate energy physically to each person, but rather allocates a share of the resources in terms of production capacity to an overall "user budget" which we divide between all the x million users in the technate.

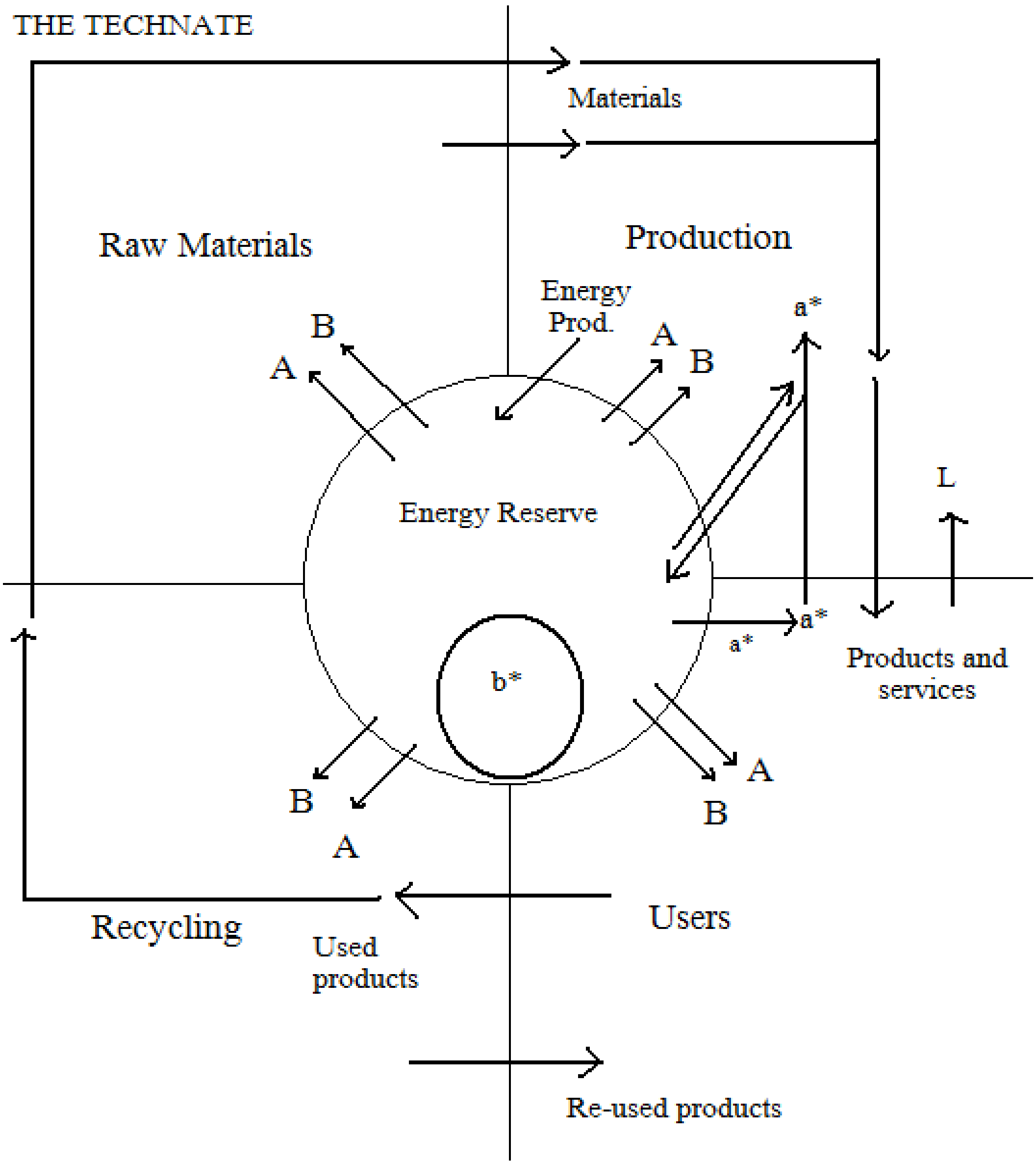

Figure Allocating energy

These would later use their shares as they see fit, and arrange their own allocation based on what they need and want. When they do so, the technate will allocate the needed energy to production in order to produce what the users have asked for. We could call this energy a*, because it is "passive" in the sense that the technate does not have any authority over what the people used it for.

We also have b* energy share we must mention, namely the completely passive "energy reserve", comprising the 10-20% energy potential which we deem we should use as a buffer in order to counter both natural but frequent fluctuations as well as unforeseen emergencies such as natural disasters.

Energy Credits

Energy Credits forms part of the resource allocation system. In such a system, the people use Energy Credits to allocate parts of the system to the production of goods. We have resources, production and goods people want. We take the resources move them to production and produce the goods needed. That takes energy to do, so we can measure the production capacity in terms of energy. We can then divide that up equally among the citizens. Those citizens can then allocate production capacity to the production of goods.

Energy credits have a number of characteristics :

1. Citizens cannot save Energy Credits as we cannot use production capacity not used in one accounting period in another accounting period.

2. The system allocate Energy Credits to individuals and as we have an internal management of the system, we do not allow the transfer of Energy Credits form one person to another.

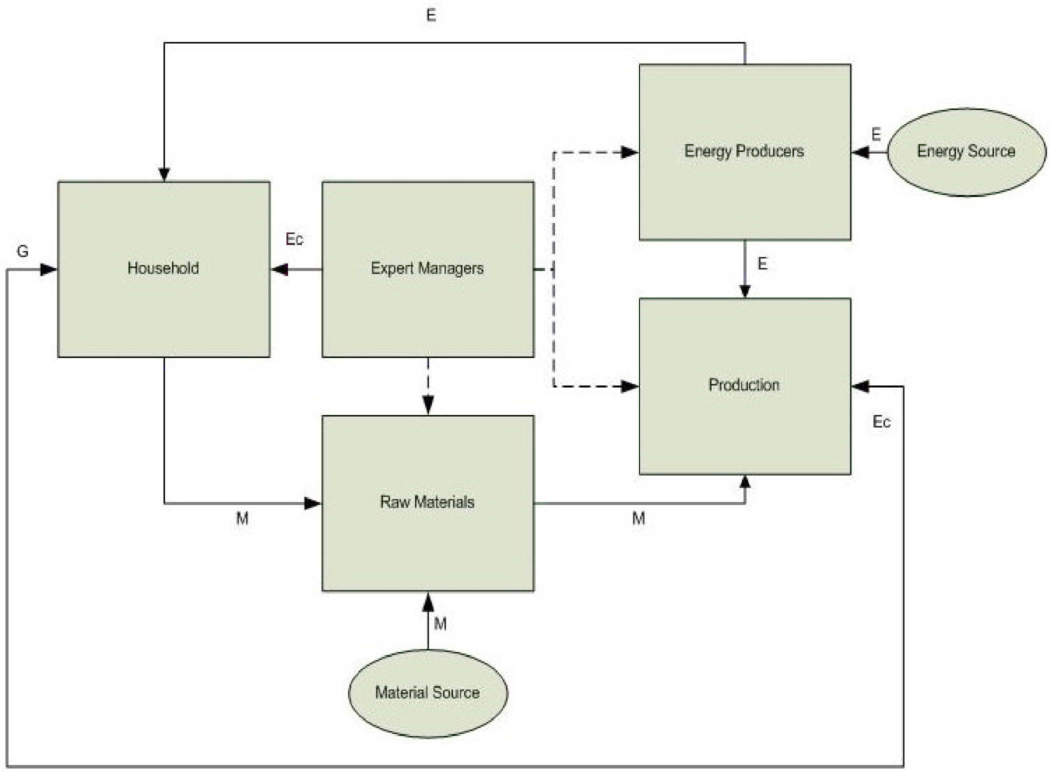

Figure Circulation within a technate

The above diagram gives the circulation of energy (E), materials (M), goods (G) and Energy Credits (Ec). Materials flow from a material source, such as mines, to production. Production produces demanded goods which then flow to the households. When the goods reach the end of their life expectancy then flow back as raw materials. Energy credits flow from the households to the production. The energy generator produces the energy required in production and for the household. Energy comes from some source. The central experts managers block manages the production, raw materials and energy production. They also issue[3] new energy credits after each accounting period[4].

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3 Alternatively we could have a system where anyone can allocate ECs. We only need to know the production capacity in terms of exergy and the number of users in the system. All users in the system has that information freely available to them and thus anyone can actually calculate their own EC allowance.

4 Or we could have a dynamic system that updates the current EC more regularly.

Management of the Resource Allocation System

As goods production forms an example of technical area that requires some period of study to fully understand, the resource allocation will need expert management to efficiently control the system and to minimise production and environmental damage, if we wish to have a sustainable system, as well as determine the cost of an item.

Determining an item's cost

Physical variables determines the cost of an item in the presented system rather than the subjective valuation of a (free) market as in the current system. We express the cost in terms of exergy so each item has an exergy value giving the amount of exergy consumed in the items production. We can use Life Cycle Analysis (LCA) as a method for determining an items cost or embodied energy analysis.

The term LCA refers to a method of determining the processes and their impact for the production of an item from the beginning of production until the disposal of the item. From the acquisition of the raw material to the production of the parts to the production of the final item and then later the disposal of the item. LCA assess the contribution to environmental damage and resource depletion but it could also record how much exergy the process of producing an item consumed at each stage. How much in acquiring the raw materials? In transporting the parts? In producing the whole? and in disposing of the item?

LCA analysis begins with defining goals and boundaries for the study. It then goes on to perform an inventory analysis. During the inventory analysis the assessors collect data on the system for the items production as well as model the whole process.

After data collection, the assessors evaluate the impact of the process in various categories. We can then evaluate these impacts and determine the actual physical cost in terms of exergy for a given item.

The term embodied energy refers to a similar process of assessing the amount of energy that is gone into a product up specified in MJ/kg. Much work has gone into this process and we do have standard tables for various different times of items. For example, aluminium has a specific energy costs of 218 MJ/kg and steel 35.4 MJ/kg making a product in aluminium more costly in energy terms than the same product in steel [bath].

In addition, we can use exergy to examine the flows of energy [Exer]. This means that much of the work we need to implement Energy accounting we already have available.

Cost Benefit Analysis

Cost Benefit Analysis forms a technique for assessing the pros and cons of the production of a item. Normally, a CBA states the costs in monetary terms. For a socioeconomic system based on exergy the CBA would use exergy as the unit of cost. This gives a more objective assessment as exergy directly relates to the physical state of the system, whereas money does not [RahDev, Owen]. Also, the use of exergy enables the assessors to fully assess the costs of an item as all benefits and cost would utilise the same accountancy unit. So, for example, the environmental impact would have an exergy cost which would lead to a more realistic assessment of costs compared to a monetary based assessment where assessors can ignore much of the environmental cost if it doesn't have any direct money value (such as if the polluter doesn't have to pay).

Optimisation

Management of the system aims to minimise impact on the environment and maintain a sustainable system. To do that, the management process would need to optimise the production of goods so that production use the minimum amount of materials and energy for the maximum amount of life expectancy. [Fran]

The optimisation problem involves a set of functions to optimise and a set of boundary criteria. An exergy based socioeconomic system would have the optimisation functions:

$$max\ f_{o1}(L)$$

maximise life expectancy (L)

$$min\ f_{o2}(M, Ex)$$

minimise material and energy (exergy cost)

Where f_{o1} and f_{o2} represent the optimisation functions.

Subject to the follow constants:

$$f_i(E, M, I)$$

within the limits of the available energy and material supply as well as environmental impact (I).

For example, an item such as a car, requires a certain amount of material of a given type; steel, aluminium or plastic. Each possibility for construction has a certain cost for production in terms of exergy; exergy using in extraction of the raw material, referencing and production of the base material as well as transportation. Each material will also have an associated life expectance. So, the optimisation problems comes down to maximising the life expectance for the minimum exergy cost such as a plastic construction might have a lower exergy cost but shorter life expectance than steel and aluminium might last longer than steel but have a higher exergy cost. At some point we would have the optimal material for a given cost.

Engineers have a variety of optimisation methods available, which include the following:

1. Calculus (max and min)
2. Pinch method
3. Convex optimisation

Calculus (max and min)

Calculus forms the basic method for optimising functions through first and second derivatives to find the maximum or minimum point of the function. Engineers could use calculus to find the point of maximum life expectancy and the points of minimum material and exergy usage as well as minimum environmental impact.

Pinch Method

The pinch method forms an example of a widely used optimisation method, specially adapted for heat energy systems and engineers use the method of optimising large scale industrial processes [Pinch]. Two phases compose the pinch method; an analysis phase and a synthesis phase.

The analysis phase involves the collection of data form measurements of the actual system and simulations. The analysis phase also uses site expertise to validate the data. From the data, engineers develop models of proposed changes. They then assess the impact of the proposed changes. The analysis phase involves iteration around a loop.

The synthesis phase aims to effect actual improvements in the system.

Convex Optimisation

The term convex optimisation refers to a set of techniques which includes least square fit and liner optimisation. Once defined as a convex problem, engineers can often find the solutions for optimising a certain criteria within given limits using well known methods such as solving simultaneous equations.

Abundance

The system of Energy Accounting relies on "*abundance*." We can see the term abundance in two ways; as system that produce more than people can consume regardless of consumption level or as a system of intelligent management that meets the demands. The first system sees resources as unlimited, thus becomes unrealistic. The second system sees resources as limited but meets demand thorough the intelligent management of those resources. Energy accounting forms an example of the second system. In Energy Accounting experts manage the resources to meet demand but also aims to reduce demand to within the limits of the resources available. We can reduce demand :

1. Through providing limited number of products (instead of 101 mobiles phones we would provide one, modular, phone).
2. Ensuring optimal life expectancy for the goods produced.
3. Reusing goods as much as possible.
4. Designing for recycling.

Examples

Example 1

For this example we will use an artificial situation consisting of three scenarios. This example has the purpose of demonstrating the basic characteristics of an Energy Accounting system. In this example:

1. A society has a production capacity of 100 units
2. Each production unit takes 1 energy unit
3. We have 10 citizens in our society.

100 unit production capacity at 1 energy unit for each unit would give us a total production capacity in terms of energy as 100 Energy Credits. With 10 citizens in our society, each citizen would have 10 Energy Credits, which they can use to allocate production to produce goods they require.

For the three scenarios:

1. Scenario A forms the base for the other scenarios. In this scenario each person orders a certain amount of goods for a given accounting period (say each year):

Person	Amount	ECs
1.	3	3
2.	5	5
3.	4	4
4.	3	3
5.	7	7
6.	8	8
7.	2	2
8.	9	9
9.	1	1

10.	6	6

In this scenario, the system produced 48 items but had the capacity to produce 100 items, so the system ran at 48% efficiency.

2. Scenario B we increase the efficiency of our production system. Increased efficiency means the amount of energy required decreases. It now takes less energy to produce the same number of goods. For this example it will take 0.5 energy units to produce 1 item. We still have a capacity for 100 items and 10 citizens so now we have a production capacity of 50 Energy credits and each person receives 5 Energy Credits.

Person	Amount	ECs
1.	3	1.5
2.	5	2.5
3.	4	2
4.	3	1.5
5.	7	3.5
6.	8	4
7.	2	1
8.	9	4.5
9.	1	0.5
10.	6	3

Each person orders the same number of goods but now they allocate less energy credits to the production of those goods. The system still runs at 48% efficiency.

3. In scenario C, we increase the production capacity and return the efficiency to the same level of scenario A. We now have the capacity to produce 200 units at 1 energy unit each. We still have 10 people so that gives 20 Energy Credits each.

Person	Amount	ECs
1.	3	3
2.	5	5
3.	4	4
4.	3	3
5.	7	7
6.	8	8
7.	2	2
8.	9	9
9.	1	1
10.	6	6

With the same number of goods demanded we still produce the same number of items. However, we now have an efficiency of 24%. In a sense, it doesn't matter how much ECs each person needs to produce the goods so long as people have enough ECs to produce the a goods they need. Thus, we can say an association with the physical system forms another important and relevant characteristic of Energy Credits.

Example 2

This example uses a type energy requirement for a household in the UK for one year [DTi].

Each household uses the following amount of energy:

- Heating 13 490 kWh
- Lighting 750 kWh
- Cold 723 kWh
- Cooking 590 kWh
- Drying 530 kWh

- Other 653 kWh

If we take 1 EC = 1 kWh, each household would need to allocate an average amount of ECs equal to 16736 EC (kWh).

Example 3

This example looks at exergy in Sweden [Wall1]. In 1980 Sweden had the following exergy:

- About 1 million PJ of Sun light, which space heating used 20 PJ and plants used the remainder (so we count just the human used part).
- About 330 PJ in wood.
- About 328 PJ in vegetable / crop production.
- About 24 PJ in animal production.
- About 340 PJ in electricity from hydro, nuclear and fossil fuels.
- About 24 PJ of iron.
- About 284 PJ of uranium.
- About 1140 PJ of chemical exergy (mainly in oil)

This gives about 2490 PJ of exergy available for Sweden. Various processes lose some of this exergy, for example the electricity network which looses 33 PJ in transporting electricity to users homes. Some processes also use exergy, for example, the iron industry used 114 PJ to produce 24 PJ worth of iron. For an energy accounting system the losses and the used exergy should also form part of the cost of the item. Thus, if Sweden used energy accounting in 1980 the citizens would receive 2490 PJ in energy credits divided between them.

Although a bit simplistic, this examples illustrates the general idea of energy accounting.

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Dynamic Energy Accounting

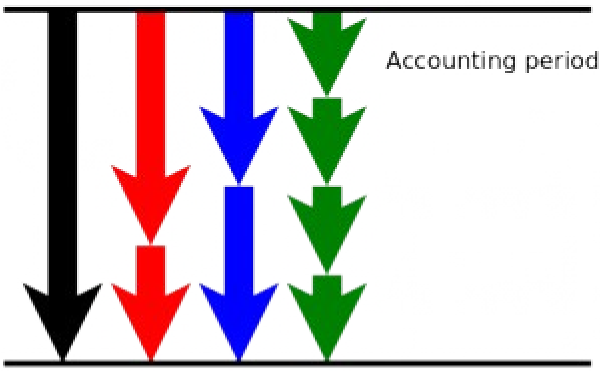

Figure Accounting period in Static model

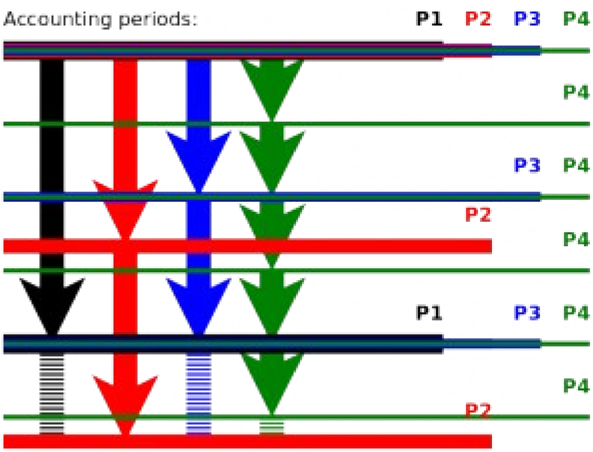

Figure Accounting periods in Dynamic model

The given accounting period that is fixed in Static Energy Accounting (the usual model [1]) and is expected to be determined experimentally, is flexible in Dynamic Energy Accounting. Because the periods are different from product to product (or from service to service), they begin and end independently of each other. Thus unlike the Static model, in a dynamic model the Energy Credit balances of the users do not reset at one point, instead the Energy Credits [2] are added and removed from the system as they (become) available.

This is made to reflect a more organic approach to Energy Accounting, where products may become available in the middle of an accounting period and where a desirable accounting period is not the same for all products. For example, a farmer may want to provide his products on a yearly basis, as the plants will only grow once in each year, and his production capacity depends wholly on last year's harvest. On the other hand, a hairdresser might prefer an accounting period of 4 hours, as she works 4 hours a day and her production capacity is determined again every day, as she comes to work. In a Static model, the production capacity of either would have to be estimated a year (or multiple years) in advance, which may grow inaccurate, due to miss-predictions. In a Dynamic model however, the figures are entered in real-time, access to production capacity is distributed as it becomes available and thus the inaccuracy problem is eliminated.

So basically, what the Dynamic Energy Accounting system does is that it measures new production capacity as it comes along. This provides a realistic and accurate representation of the current energy input that is available for the users of this system to consume. As we already know, Energy Accounting focuses on the amount of energy required in order to make a product available for usage. So in our case of the hairdresser, this person uses electric energy to power its tools and chemical energy by performing the service. If this energy usage is represented with a objective physical unit, then we are able to designate this amount to the product itself and by doing this it becomes evident as to how much energy we have to use to make it happen. The method used here is called Energy Input Labelling [3] and its relation to Dynamic Energy Accounting is fundamental in the way that every time it is possible to make a new product available for usage and at the same time labelled with a certain amount of energy, it becomes evident that our pool of users acquire new capacity to consume. Thus, in order to make this possibility evident to them we also have to increase the amount of Energy Credits that they possess by the amount of energy on this product's label. By doing so, Energy Credits serve as a reliable tool for all users who want to know exactly how much production capacity is available to them in a given point in time (e.g. in a Technate [4]).

Dynamic Energy Accounting is enabled by modern-day computers. While it is possible to implement the Dynamic model without computer support, the sheer amount of bureaucracy makes this impractical. The Static model makes sense where the information collection is done by hand and records are kept on paper. A modern computer and internet-supported environment however, makes the Dynamic model both possible and practical, as the information on production capacity can be entered, transmitted and stored easily and all calculations can be re-done instantly.

However because the Dynamic model adds and removes Production Capacity dynamically, the balances of the individual users' accounts change as production capacity is added or removed. Viewed from the perspective of a user living in Capitalism, this may appear unnatural as the account balance changes without the control of the individual who owns it. All is not as it appears though, since even while the money amounts on the accounts may seem stable in Capitalism, the actual value changes from day to day just as dynamically, or possibly more.

Benefits

The benefits of a dynamic ENACT system can be summarised into the following points:

- Lack of an arbitrary pre-set global time period of production review
- Real-time tracking offers an accurate and up-to-date estimation of the production capacity available in the system
- The system reacts to inevitable changes in the production capacity caused by factors other than product usage (e.g. new production, production loss, external distribution)
- Avoiding a potential miscalculation regarding the production potential available in a system due to long-term projections
- Independence of separate production cycles and immunity to distortions in production tracking due to changes in the production line
- Small scale usability due to its sensitivity to individual changes in production capacity

As already mentioned, production in a given economy follows different time cycles when it comes to different products. This is why it makes it hard to submit all production to a particular general time frame in which some products are accounted many times over while some are accounted just once. Founding a distribution system on individual products gives us a reliable method of tracking the actual amount of products ready to be produced and consumed at any point in time. The hazards of allocating productive means to certain areas while recklessly diminishing on other is reduced be keeping an eye out on the unprecedented changes in productive capacity.

Problems

However the Dynamic model also has certain downsides, which come from it's more complex nature.

Negative balance

Because the Energy Credit balances do not reset once a year, the method of their elimination from the system is much more complex than in the Static model. As elimination of lost production capacity from the individual User Accounts to which it has been distributed, may cause a negative balance which does not occur within a Static model, a creative solution may be required to determine what happens when this occurs.

In either model, the problem of maintaining a balance is present. Either the system:

- shares all resources fairly amongst the population
- limits those who spend too much energy

In the Static model, the threshold between these is determined by the length of the Accounting Period. If it is longer, those who spend too much energy and do not plan ahead, will run out of it by the end of the accounting period. If it is shorter, people's balances will reset to a value that is the same for everybody soon enough.

In the Dynamic model, this threshold is non-existent, as distribution of available capacity is done in real-time. The question here is then when production capacity disappears from the system, should it disappear in an equal share from everybody's accounts, causing a negative balance with some (which would prevent them from making any more purchases until their energy balance filled up to cover their debt); or should a more complex, more fair system be used instead, which only removes a share of energy from each of the users' accounts, totals up to the amount of energy removed from the system and does not permit a negative balance?

There are also other possibilities, but either way, the answer is not straightforward.

Production Allocation

As there is no fixed period, production shifts from industry to industry cannot be calculated all at once at a given time. Instead Production Allocation becomes a whole new issue.

In a Static model, when there is more demand for a particular service than another, the organizations are notified of this at the end of the accounting period and changes can be made to increase or decrease the production capacity, which is then reported before the new accounting period begins. This is impossible within the Dynamic model as there is no common time between accounting periods in which these figures would be compared between industries and the changes made.

In a Dynamic model, the figures regarding unused or overused production capacity would still be available to the organizations at the end of their corresponding accounting periods.

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Engineering Society

Introduction

The concept of a holon forms one of the central ideas proposed for forming a (proto-)technate. The concept has its origins in observations of nature. Arthur Koestler noticed two observations of nature; that complex systems evolve from simpler systems and in nature "wholes" and "parts" do not exist (things tend to make things which in turn have other thing making them). The holon concept has found use in areas such as distributed artificial intelligence, multi-agent theory and distributed manufacturing research as well as real world applications such as the method of operation of the VISA credit card.

Holons

The word "*holon*" comes from the Greek "*holos*", meaning 'whole', and "*-on*", meaning 'part'. The word aptly captures the duality of entities which are at once single, distinct entities, and at the same time parts of a more comprehensive whole. For example, a cell in your body falls within the holon category. Cells exists as a distinct, living entity; it has inputs, outputs, and a distinct cell wall defining its interface with the rest of the world. A cell, however, consists of smaller and more fundamental parts, such as RNA, DNA, mitochondria etc. We can study each component as a separate entity; however, we can break down each component further - into molecules, atoms, and ultimately to quarks. This decomposition of cells forms a characteristic of a holonic organisation.

We can also go the other way, and see that cells group together with other cells to become organs. Organs, in turn, form parts of the human body. Here, we see that holonic organisation also supports composition as well.

We can find many other examples of this part-whole relationship in the world around us. Ants, for example, exhibit such characteristics. We can study ants as separate entities in their own rights; but, they also form parts of a society. Trees and forests as well as people and cities form other examples. More artificial examples would include agents that engineers have used in

Distributed Artificial Intelligence and even the humble sub routine in a program.

Characteristic of Holons and Holonic Systems

In addition to the part-whole characteristic, holons have a number of other characteristics:

1. Each holon can function autonomously. This means that each holon carries out its own activities without the direction of other holons; yet, it still forms a part of, and contributes to, the overall functioning of a larger system.
2. Holons naturally form distributed systems. This comes from the autonomous attribute.
3. Each holon has a simple, singular task to perform and concentrates exclusively on that task. The system accomplishes larger scale tasks through the combination of a number of holons, either through combining them together to form a larger holon, or through cooperation or competition between holons.
4. Although holons function autonomously, their interaction with other holons may yield complex flows of information in order to achieve each interacting holon's goals. Therefore, a holon must process and respond to in-bound data from external sources, as well as provide other holons with requested information.
5. As holons interact, the sum of their actions could become greater than the action of the individual holon. Some examples could include ant hills, where a number of ants cooperate to construct a mound, yet no single ant would have the capability to achieve the construction individually. The construction of cities forms another example. The shapes of many of the world's cities did not result from centralised planning. Nonetheless, the organisation and interaction of a number of people and organisations has resulted in some of the most

spectacular cities on Earth, such as San Francisco, New York, Rome, and others.

The Advantages of Holonic Systems

Holons have characteristics that make them particularly well suited for complex and/or distributed systems. Some reasons follow:

- Scalability. As each holon has the property of being autonomous, it can function with little or no knowledge of other holons. Thus, we can add additional holons to the system, depending on the system in question, without affecting the operation of the previously existing holons. As we add additional holons to the system, a coherent organisation will tend to form naturally, such as a hierarchy where higher-level, more abstract holons manage lower-level, more detail-oriented holons. Consider, as another example, any plant or animal, which starts as one cell, but which divides and grows to many cells, forming organs along the way.
- Robustness. Robustness also results from the autonomous nature of a holon. Just as we can add holons, we can also remove them without, in general, affecting the functioning of other holons or the system as a whole. For example: human body can lose many cells without even noticing it. It can even survive the loss of a substantial portion of the body, such as a limb.
- Simplicity of control. As each holon has a simple, usually singular, task to accomplish, it only needs a simple control mechanism, which we can understand more easily when compared to a centralised control system.

Disadvantages of Holonic System

Distributed and autonomous holons, for all their advantages, also have some disadvantages compared to centralised mechanisms.

- Tragedy of the commons. The autonomous attribute can lead holons to consume shared resources without consideration for others, and end up taking more than their fair share. This could limit the ability of other holons to work, and may even bring an end to the common resources. Example: a farmer allowing his cow to eat all the common grass, preventing other farmers from grazing their cattle.

- Losing their way. We can see another problem with the autonomous attribute. Autonomous holons could conduct activities that do not contribute to the overall goal of the system. They could even conduct activities that have a contrary nature to the overall goal. Cancer cells would form an example of holons that have gone out of control and became a danger to the system as a whole.

The root cause of the first deficiency we can usually attribute to a lack of negative feedback in the holon's operation. For example, if the farmer knew a priori of the impact the cow would have on the field, and therefore other farmers, he would take steps to alleviate the problem before it got out of hand. The farmer would need a bigger picture to achieve this insight. However, this leads to one possible solution, where a higher-level holon could administer lower-level holons. Not an ideal situation; preferably, the other farmers communicate with the offending farmer, so that they resolve the issues locally and quickly.

We may, however, have difficulty understanding the cause for the latter deficiency, since we have a number of issues to consider. For instance, simple miscommunication or misunderstanding may result in an erroneous interpretation of the holon's goal. Indeed, scientists have traced most causes of genetic defects that, in a sense, we can consider as miscommunication in genetic programming of the cell. We could see another cause as the autonomous nature of the holon, which could deliberately decide to change its own goals. The "bait-and-switch" manoeuvre that con-artists and other petty criminals use exemplify this.

A Holonic Structure for a Future Technate

We propose the following holarchy:

- 1. Individuals
- 2. Groups
- 3. Zones
- 4. Areas
- 5. Sectors
- 6. Technate

The proposed structure forms the foundations for a technate.

Individuals form the basic building blocks of societies, and each individual has their own goals and objectives as well as skills and interests. Any social structure should take this into account. The holonic structure would allow people to utilise their interests and skills to achieve their own desires in such a way as to contribute to the whole structure.

To achieve this, individuals form task orientated groups, such as research, medical, and food production. Individuals who have skills and interests in common with a specific group could choose to join that group. However, not all groups would have specialised interests; some groups would have a more mixed membership. This would depend on the size of the group and its function. Each individual also has membership of a sequence relevant to their skill and interests.

Groups maintain goals and run projects. The goals of any group should have compatible with the overall goals of the technate. Likewise, the projects within the group should contribute, in some way, to the group and thus to the implementation of the overall goal of the technate.

Groups work at a local leave of a community. One community may have several groups handling, for example, power production, building maintenance, food production, education. Members appoint people to a group based on their technical expertise. So, for example, electrical engineers would appoint people to a building management group that requires someone with electrical expertise. Other experts would appoint others as needed. The electrical engineers would then work on electrical projects within the group.

Some projects, of course, may turn out to be too large for a single group to undertake (e.g., repairing the Golden Gate bridge or the construction of an airplane). To deal with this, groups can form areas, where areas act in similar ways to groups. Instead of having a composition of individuals, however, areas have a composition of groups (think of a consortium or standards organisation, like OSI, OMG, and ANSI). Areas cooperate with each other to fulfil the goals defined for each area. Those goals, like the goals of groups, have compatibility with the goals of the technate. And, of course, the projects run within areas will have similarity to the projects of groups in that they would also contribute to the goals of the technate but on a larger scale.

Groups form areas as and when needed. Some areas may become permanent but other can come and go in connection with a given project. For example, a number of groups may form an area when they need to construct some communications infrastructure between two or more communities. Once build, the communities may have no more common projects so they dissolve the area. Alternative, the area may become a permanent structure to coordinate common projects such as maintenance of the common infrastructure.

Each group will appoint members to an area that they belong to.

Again, like areas, sectors form the next level up in the holarchy and run larger projects. Areas compose sectors. Areas form sectors, again, as and when needed. They also can become permanent structures.

The technate forms the final layer of the holarchy. This layer runs large scale projects over the whole operational area of the technate and has goals in accordance with main goals. The technate forms the only designed permanent structure.

Thus, the whole system becomes a gestalt - one composed of individual, goal orientated parts that use projects to achieve their goals. As each part lines up with other parts in the holarchy, through cooperation, the system achieves the overall goals of the technate.

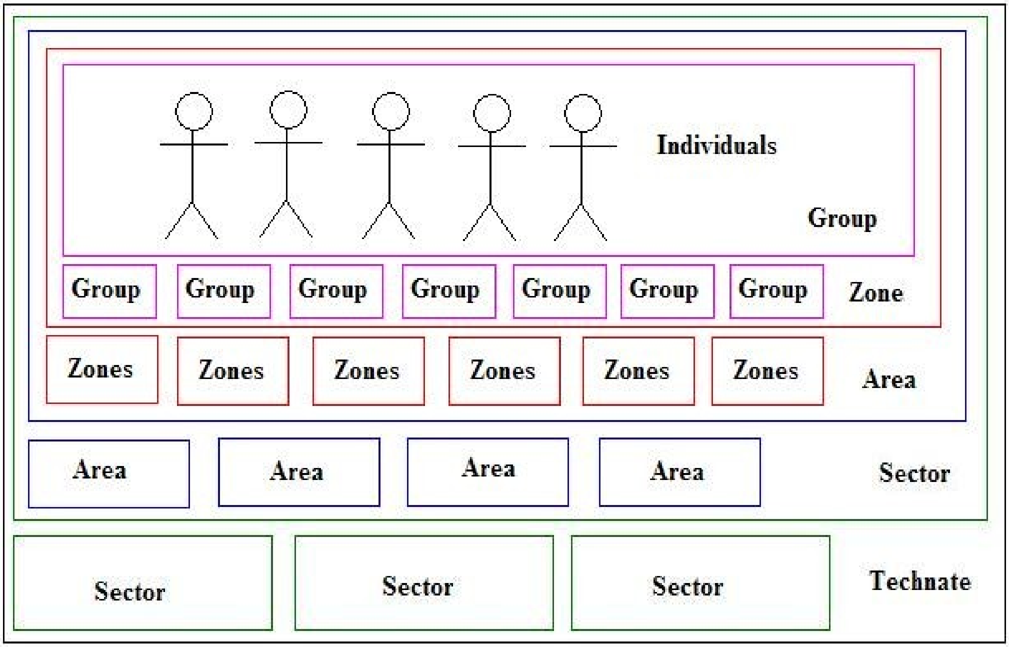

Figure Holons within holons

Control and Direction in the Holarchy

As each group, area, or sector can act autonomously, the system has the potential to develop some problems, as noted above. Some of the holons could end up repeating work that other holons have conducted and other holons could conduct work that does not contribute to the whole.

To prevent such problems, we propose a hierarchical structure that lays on top of the holarchy. This overlapping structure would have the following goals:

- 1. Maintain direction of the system (such as ensuring projects follow goals and setting of common standards)
- 2. Act as a communications channel to facilitate cooperation between holons
- 3. Ensure efficient utilisation of resources, thus preventing unnecessary repetition of work

The proposed structure would have a board at the top which acts to direct the whole system. A number of functional sequences would then form under the board, with the director[5] of each sequence being represented on the board. Each functional sequence represents a technical area. For example, the structure could have functional sequences for health, research, manufacturing, mining, recycling, energy, transportation and space.

Each sequence would have a sub-sequence for each sector, if one exists. So, for example, the Sequence of Research would have a number of Sector Sequences of Research below it. Each sector sequence would then have area sub-sequences below it, and the area sequences would have group sub-sequences below it. Each sequence at each level would have a director. For example, the Sequences of Research would have a Director of the Sequence of Research and the various sector research sequences would have various Directors of Sector Sequences of Research and so on for areas and groups. We can see this as being analogous to a commercial company in present-day economic systems, where you have a Chief Technology Officer, Director of Research, with individual project directors below them.

This means that an individual would have membership both in a group and a sequence and, hopefully, will actively participate in a project.

If we think of holons as cells, organs etc. then we can think of the hierarchy of sequences as a skeletal framework that give the structure to the whole.

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5 A note on terminology: We use the term "director" in this publication as we use the metaphor of a "well-run company" as an example of a technate. However, we could use other terminology such as "overseer" and have an "oversight committee" instead of a board of directors such as using in the Atlas Initiative.

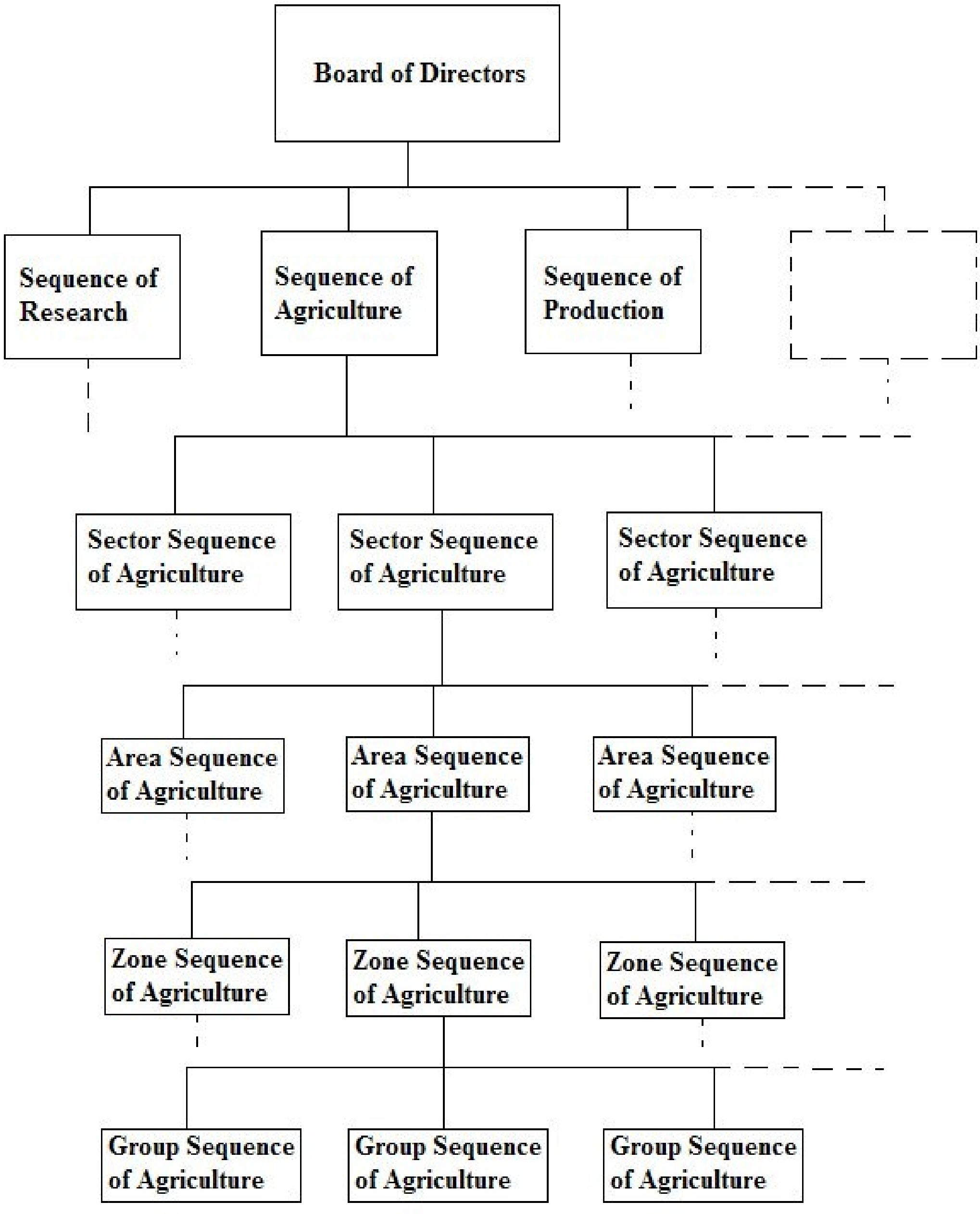
Board of Directors
Sequence of Research
Sequence of Agriculture
Sequence of Production
Sector Sequence of Agriculture
Sector Sequence of Agriculture
Sector Sequence of Agriculture
Area Sequence of Agriculture
Area Sequence of Agriculture
Area Sequence of Agriculture
Zone Sequence of Agriculture
Zone Sequence of Agriculture
Zone Sequence of Agriculture
Group Sequence of Agriculture
Group Sequence of Agriculture
Group Sequence of Agriculture

Figure Hierarchy of sequences

Roles of Directors

Directors of each sequence have overall responsibility of ensuring that each holon contributes to the overall goal of technocracy. Thus, the directors at each level have to approve each project, and can cancel a project if that project has wandered away from the goals of the technate. The director can also cancel a project if it is in conflict with another project; for example, if two holons attempted to do the same project. However, once a project has started, and so long as it remains compatible with the goals of the technate, the director *has no control over the project* in keeping with the autonomous nature of the holon.

Each project would have a project manager. The project manager has the administrative responsibility of running the project, including the allocation of resources, time schedule, etc. The manager runs the project without any interference of the directors as long as the project remains within the goals.

For projects that involve cooperation or coordination between a number of holons, the holon director has the responsibility of ensuring communication with other holons. For example, within an area the Area Director must ensure that all holons have adequate communications in order to allow them to conduct their projects. Thus, the sequences act as a communications channel for each holon.

Goals

Goals become the most import attribute of the above structure. Goals give direction and purpose to the system as a whole.

The technate has the following top level goal:

The highest standard of living for the longest time possible for all human beings.

To achieve this goal, sequences and holons may have other goals, but those other goals must contribute to the overall goal. For example, the Sequence of Research could have the goal of conducting an energy survey and may run one or more projects to achieve that goal. However, the goal of the energy survey also contributes to the overall goal of the technate in that it determines the kind and quantity of resources available and the energy required to build a sustainable society that has a high standard of living.

Forming a Holon

The holonic structure of a technate has a dynamic nature. Individuals or groups of individuals can create new holons as needed and as old holons no longer have a function they can disappear. Basically, holons have a purpose for existence in that they contribute to the overall goal of the technate. Holons can work on one or more projects as needed. They can have a geographical location or they can exist as virtual entities on a Computer Network.

Creating a New Holon

1. New holon is added by the decision of a board of directors at the appropriate level in the holarchy. Basically, the director has the responsibility to ensure that the holon has compatible goals and can communicate with other holons.
2. The new holon needs to describe its goal, areas of interest, and the decision making process. The goals but have compatibility with the overall goals of the technate but the members of the holon decided internal running of the holon.
3. In case another holon covers the stated goals, the holons should initiate a procedure for merger (or close communication) to avoid the double work. We can have more than one holon doing the same task. For example, both holons may serve a defined geographical area.

Ever a director or one of a holon members should register the new holon. Holons can form other holons to cooperate on common projects. The newly formed holons then hold a position higher up the holarchy. Should

Disposing of a holon

As no one works within a holon the holon effectively disappears from a system as people leave the holon. A director or another appointed person should carry out affectively a garbage collection function and ensure that any holon no longer functions gets deregistered in the system. This should occur when a holon no longer has the function but can also occur if the holon for some reason becomes corrupted.

Example Implementation

One community example

A single small community has the following task areas:

- Building
- Agriculture
- Energy
- Waste management

Personal within the community

- 2 electrical engineers (members of the Sequence of Technology)
- 3 agriculturalists (members of the Sequence of agriculture)
- 1 carpenter (member of the Sequence of Architecture)

Groups within the community

Buildings group:

1 electrical engineer 1 carpenter

Agricultural group :

1 electrical engineer 3 agriculturalists

Projects

Within the Buildings group the members have two projects

- Energy / electrical distribution - 1 electrical engineer

This project maintains and updates the power generators and electrical distribution within the buildings

- Building maintenance - 1 carpenter

This project maintains the buildings

Within the agricultural group, the agriculturalists have three projects

- Food production / farming - 2 agriculturalists

This project produces the food for the community

- Algae project - 1 agriculturalist

This research project looks at growing algae both for food and energy

- Engineering support - electrical engineer

This project manages the electrical systems used in agriculture outside the buildings

Cooperation and communications between the projects

Both the electrical engineers keep each other informed and cooperate when they have problems.

The building, food production and algae projects also inform the energy project on their needs and problems.

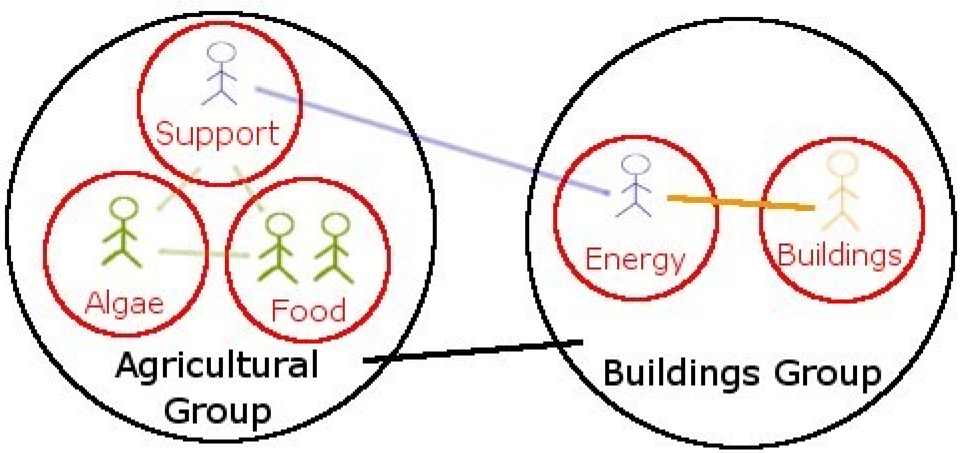

figure One community example

A Simple community

The diagram shows groups within a community, each group running its own project. The members of each group also have membership of a sequence.

- Black - groups

- Red - projects
- Green - Sequence of Agriculture
- Blue - Sequence of Technology
- Orange - Sequence of Architecture

The lines represent communication and cooperation.

A Multiple Community Example

This example presents aspects of inter-community cooperation and the formation of zones. Each community has the capacity to produce the food and energy it requires as well as waste management but makes additional gains through cooperating with other communities.

The Communities

Community A

Has excess energy production capacity do to its physical location so acts as a energy farm.

Community B

Has a good location for growing. In addition to basic food stuff it also grows some more luxury crops such as strawberries and spices.

Community C

Has taken on extra manufacturing and produces clothe items for distribution to all three communities. This requires some extra energy from the energy farm and some raw material (in the form of cotton) which each community contributes to.

Zones

In addition to groups each community also contributes to the formation of a zone for clothes production, luxury food production and energy production.

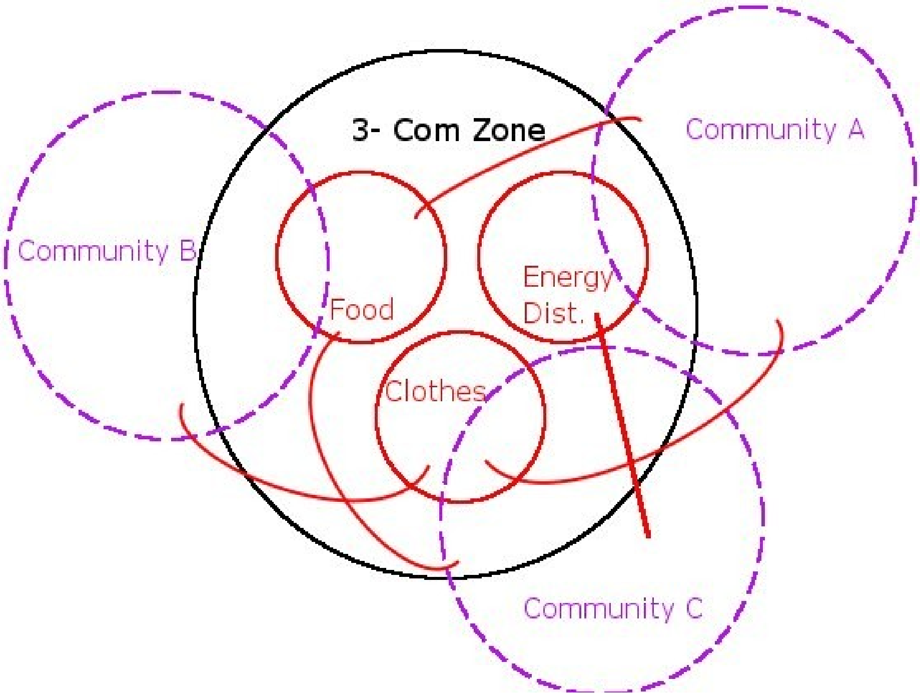

Figure Three communities example

- Black - zone level
- Purple - communities
- Red - projects

The lines represent communications and cooperation

Three communities join up to form a zone. Each community runs its own projects internally but they also contribute to projects between them. The zone runs projects to manufacture clothes, grow luxury food and provide additional energy. Community C produces clothes, which it distributes to all three communities. Community A produces extra energy for community C to use in manufacturing. Community B produces spices and strawberries for consumption in all three communities. In this way, each community gains something from helping the other communities.

A Technate Level Example

This example looks at just one aspect of the technate level; transport infrastructure.

The lower levels form higher levels in the holonic structure and different parts of the structure can come and go as needed. However, the top level of the technate has a permanent status but the lower levels still drive the projects. The transport infrastructure forms a set of such projects.

The groups in the communities drive the need for a transport structure to enable people to move from place to place. Each community would have a group that maintains and manages the local transport hub. However, transport systems need an A to B and the transport group can manage transport within a community but to move from community to community or urbanate to urbanate a number of transport groups can join together to form a transport zone. However, the system can have other complexities such as deciding the most efficient ways to interconnect each community. For that a we would need a technate level holistic over view.

At the technate level, we can maintain a long distance network that transports people between major hubs in larger groupings of urbanates. We can then divide the technate into specific sectors which maintain a transport network between the major hubs of smaller urbanate groupings within each sector. Sectors can then have area networks with their own zone networks.

For example, the technate could plan and maintain hi-speed monorail networks for the major routes between, say western Europe and eastern Europe. Within those sectors, more hi-speed mono rails could link smaller groupings of urbanates. Between major urbanate groupings we could have an area level autonomous transport systems that transports people from major urbanate groupings to smaller urbanate groupings. At the zone level we could find projects that maintain the link from one urbanate to another and within each urbanate we could have a group level project that plans and maintains cycle tracks.

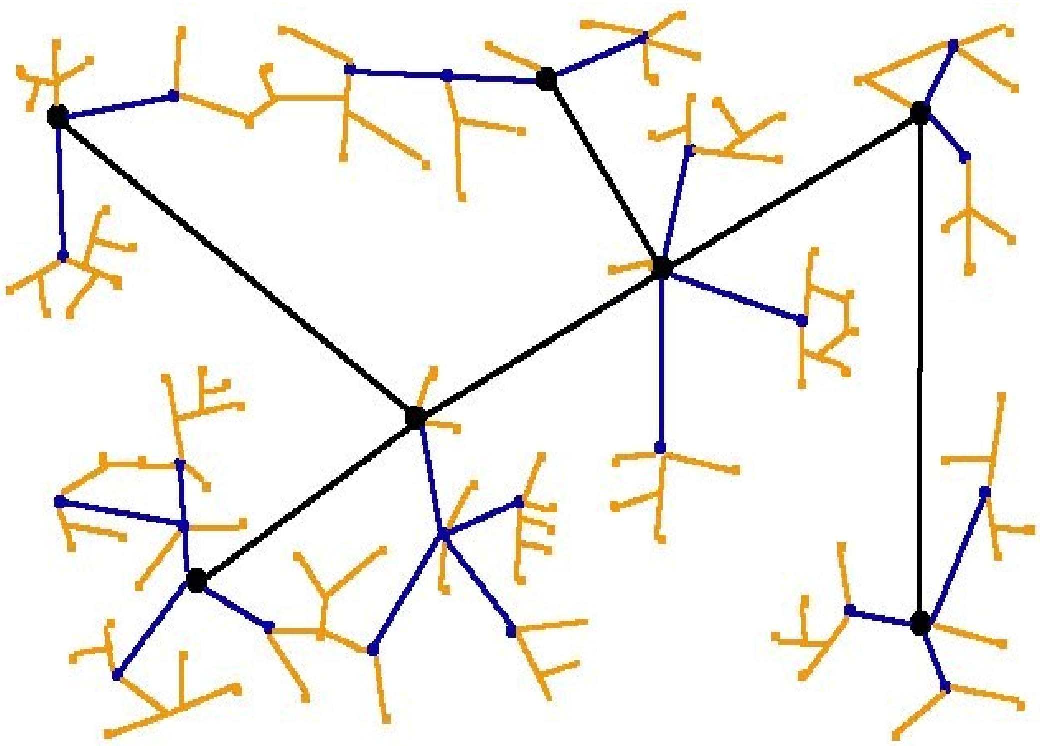

Figure A rail network example.

An Example Transport Network

- black - main transport branches maintained and planed at the technate level
- blue - sector level transport network
- orange - area level network

Zones (not shown) would manage each individual track between two urbanates and groups (not shown), the transport structure within an urbanate.

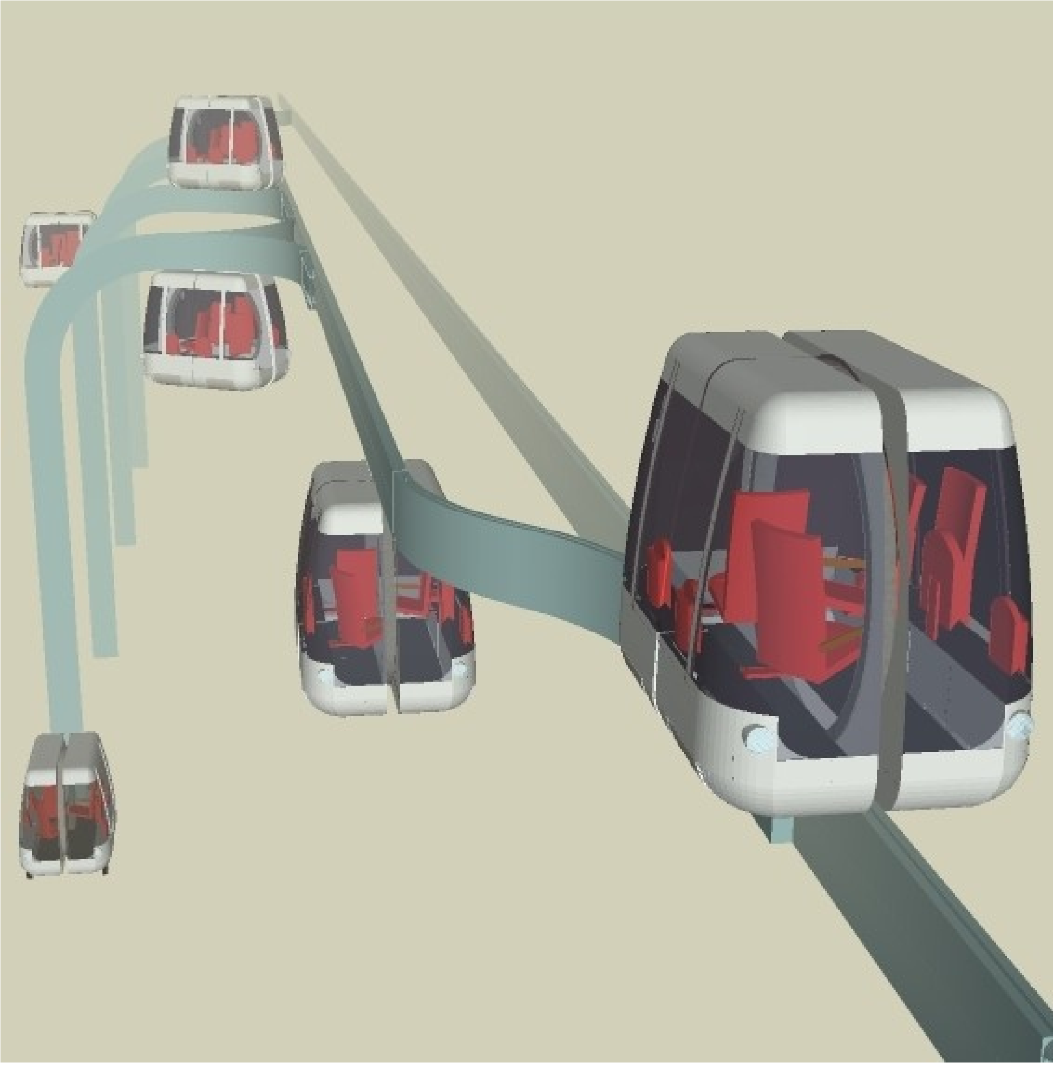

Figure OSCar forms a possible example of a zone level autonomous transport system.
http://www.weworldtech.com

Figure Hi-speed monorails form an example of a possible technate and sector level transport system.

Source: http://www.transfuture.net/

A Technate Level Network Example

Not all projects need to have a physical attribute. People can work on some projects regardless of their geographical location. Software projects such as games or operating systems form such an example. For such projects we may see technate level projects forming as needed when people come together over a computer network and work on a project with no lower level holons such as sectors or groups.

A computer game forms an example of a project that could lie on the technate level. People can work on the project from any location.

Alternatively, we could also see groups, zones, areas and sectors forming even if the project doesn't have a geographical nature. For example, if we wrote an operating system such as Linux we could have the operating system project as a whole located at the technate level. However, we could see "group" level projects forming such as a group that works on network drives. They could team up with other group that handle, say, screen drivers or display drivers, to form an zone that dealt with driver projects as a whole. Other groups may form to handle user interfaces or application software as needed.

A Sequence Example

This example looks at a zone level sequence.

A number of communities have come together to form a zone to manage a set of common projects. They have elected a board of directors for the zone for a five year term. The board has three members:

- Electrical Engineer - Director of the Zone Sequence of Technology
- Agriculturalist - Director of the Zone Sequence of Agriculture
- Architect - Director of the Zone Sequence of Architecture.

The board then elected the Agriculturalist as Zone Director.

The directors have decided to implement a forum, archive and wiki for each project within their zone on their local servers. The forum enables members working on zone level projects to send open messages to other members and the wiki enables them to work on common documents. The archive forms the location for all official and approved documents.

In addition, the directors send out a newsletter to keep each zone member and members of the underlying group informed of what each project currently works on.

The forum, archive and wiki remains open for all members of the zone and groups as well as any other member of the technate, to review the projects within the zone. The forum has a open section for people not in the zone to comment on projects within their area of expertise. So, for example, other architects can comment on the zone's architecture projects.

When members of the zone or groups start a new zone level project they post it on the wiki. The directors review the project but have no say on how it runs. However, if they notice that the project does not contribute to the goal of the technate, if, for example, it duplicates unnecessary work conducted elsewhere, the directors can stop the project.

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User Rights vs Ownership

Ownership as a concept within a technate has limited use. As all the land, production facilities etc. all come within the domain of expert management it becomes irrelevant who owns what as the "owner", if we have any, has no say on how a factory runs or what crops grow in a given filed as the holons will decide that. Instead of ownership the design calls for usership rights where an individual has the right to use anything within the domain of the technate such as the transport system, or production facilities so long as each individual uses the facilities as intended through design and responsibly.

What constitutes ownership?

Ownership[1] is by its very nature exclusive. It means that you, granted by society or by your own strength (given if you live in an area plagued by social chaos) holds a physical object, a bit of land or a privilege, and that you have the right to interfere and punish people who also are trying to use that property.

Some things are naturally exclusive, as the food you have been eaten or the (particular) energy you have used in operations of electronic equipment. Some things *could be made exclusive* through laws or the use of force, like most of the things you are owning - these things are thus *exclusable*. Some things are naturally inexclusive, like air or a stream of fresh water.

In most of Europe, the usual way to organise the administration of property or land, is to deal it out in the forms of ownerships, which are sellable (and then of course buyable), rentable and possibly to use as a security for debt. By definition, we could then say that Europe today works by allocating out ownerships and reaffirming them through legal and physical means (police, courts).

The ownership grants are very different in size and forms, and the rules tend to vary between European countries, but yet, the general tendency is clear. We are supposed to operate the machinery, the water and the living we have through ownership.

What constitutes usership?

Usership, in contrast, means that you have the exclusive right to use something without hindering anyone else from using it as well. One example of a usership is collective travel. Another one is public parks. In Sweden, we have a rule which is called "The Right to Roam"[2] (Allemansrätten) which allows you to enjoy nature and camp almost everywhere you want on the countryside.

Under such a system, you still have responsibilities to not for example vandalise or junk down the service you are utilising.

Thus, we see that usership is actually not something new but something which exists under the current system as well, and which thrives (public travel is increasingly getting popular due to the more environmentally aware urban citizenry).

Not only society is using usership as a mode for operating travel and recreation, but smaller groups within society is doing that as well, like for example sport clubs, youth hostels and public educational facilities.

Of course, there is a gray zone between usership and ownership. Sport clubs do not for example allow people who are not members of the group use their equipment. It is therefore sane to speak about a grade-scale characterised by exclusivity. We are not implying that exclusivity is inherently bad either, even though it could be used to discriminate against people (the discrimination is inherently unacceptable if based on factors which the person herself could not affect, like ethnic origin, income or gender).

Usership and ownership in a technate

We often forget that the basis of the technate is personal ownership of one extremely important thing.

Namely ***the energy credits***.

The energy quota which a person possesses in a technate, is the sole, exclusive privilege for the benefactor of that service. Even though Karl and Jasmine are receiving access to an equal share of the production capacity of the technate, they could not exchange their credits, or trade parts of their energy quotas with each-other, since the energy credits are designed to allocate energy credits into machinery operated by the technate.

The ownership of your energy quota, marks your right to access the production capacity of a technate.

Thorough the rest of the technate, all the land and all the production facilities, are open to your right of usership. You have the right to use electric machinery, and have such installed at your house and apartment. You have the right to the semi-exclusive usership of such machinery during the time when you are using it. If you for example wants to use a private vehicle to travel from one urbanate to another, you plug in your energy credits. A screen will appear where you will get the option of how long time you want to use the vehicle, from maybe a few hours to some months or even for the duration of the consumption cycle.

Thus, the technate is characterised by an absolute personal ownership to a share of the resources, while the resources themselves by definition are usership allotments. You cannot own a particular factory or a particular mean of production, but you have the right to use your energy quota to allocate their usage upon you.

Examples

Example 1 - Production facilities

Individuals use production facilities through the allocation of energy credits. Each individual can then allocate x amount of energy credits to the production of a given item.

Example 2 - Housing

Individuals of groups of families can have usership to house to live in. They receive the rights and can use the house as their home for as long as they wish. In this case the house has a sign use attribute so that if one family uses a house for their home others cannot unless the first family allows them access. The technate takes responsibility for managing the house and installed facilities unless the house users wish to take on that responsibility themselves. Thus, users can modify their house as they wish.

Other types of housing can also exist in differing communities such as shared housing where all the occupants share a common building and common facilities.

Example 3 - Transport

The technate will operate a common transport infrastructure such as mono-trains. All citizens have the right to make use of the service provided. The technate can also make personal transport vehicles available as needed as well. The vehicle will arrive when ordered and the user can use the vehicle for their travels. When they have finished, the vehicle returns to a common pool.

Motivation

Abstract

Motivation plays an important part in a society that operates without money. This chapter looks at motivation and what motivates people. It then looks at money as a motivator and considers that money in itself does not act as a significant motivator but does represent a number of motivations. The chapter then looks at motivators in the work place and considers that a number of motivators that effect people personally act as better motivators than money. The chapter then concludes with this point in mind, the design calls for the need for the careful design of work places to motivate people.

Introduction

The design calls for the minimisation of work thorough automation and intelligent management of resources. However, the technate will still need work done. The system of management that EOS proposes does not use money as a means of exchange or resources allocation. This leads to a system where people can place demands for goods though the allocation of energy credits, which represent the system's capacity to produce. So long as a person forms part of society they will have an equal share of the productions capacity of society. We can therefore, see this as a system where people work for free and obtain goods for free as they receive no monetary compensation for working. This brings up the question; why work in a Technate when you can obtain what you want for free? This chapter looks at motivation to answer that question.

Motivation

The word "*motivation*" and the word "*emotion*" both have a common root in the Latin word "*movera*", meaning "to move" and shows that motivation and emotion have a close link [Passer, Gross]. What tends to motivate us tends to have a personal, emotional aspect for us. This means that *making it personal* becomes a key element in motivating people.

We can divide motivation into a number of different types.

- Push motivators. Such as hunger or the need to keep warm and dry. These motivators drive people to action to maintain homoeostasis.

- Pull motivators. Such as incentives. These motivators result from external stimulus to achieve action such as rewards.
- Sensation seeking. These motivators work on seeking out novelty.
- Social motives. The desire to belong to a group and peer pressure form example of this type of motivator.
- Achievements. These types of motivators result from the desire to win or the fear of losing.

Within these different areas of motivation come a number of over lapping concepts such as status or goals. Status could result from our need to belong to group and our need to achieve as well as from pull motivators. Goals form a central concept for all forms of motivators as all motivators cause us to act to achieve a goal.

Money as a motivator

Organisational psychologists have conducted various different studies of work and why people work [Bass] and conclude that although money plays an important part in motivating people to work it does not form the sole contribution to work motivation. In the past, people considered money as a strong motivator. In a price system culture, people assume that the desire to earn money forms the main motivator. However, some studies show the perception of a fair pay has higher value than the actual amount of money paid and money as a motivator does not hold such a high position as initially thought. Although money does motive, other benefits such as health care or extra holidays have a higher ranking among many workers than extra pay. Other factors for motivation were the influence of groups and the individual's culture. Culture aspects of motivation result in attitudes such as the protestant work ethic. However, this only appears as the case in wealthier nations; in poorer countries, pay forms a very important motivator. However, this may result from the low pay conditions that many people experience in poorer counties so that money has a high motivating factor as it can make the difference between having enough to eat or not.

Yet further investigation of money as a motivator shows that the actual money does not motivate people. People do not just earn money and then sit on it. They use the money for something, such as buying a house or food or saving for a rainy day. Thus, money stands in for or represents a number of motivators and the power of money to motivate comes from the fact that people can exchange it for other items that do motivate them.

Motivation in the work place

Some of the strongest motivators in the work place environment include the opportunity for personal accomplishment (mastery), growth (challenges), social relationships, purpose as well as cultural factors. Programmes aimed at improving work motivation have taken a number of forms. Some have concentrated on enriching the work environment though providing opportunities for personal growth and to develop different skills. Some schemes have concentrated on rewards such as extra time off or increased pay for desired behaviour. Setting objectives and goals has worked as a strong motivation technique. Each of these techniques adds something personal to each individual. However, some techniques work well with some people but not with other as different people have different motivating factors [Warr]. For examples, sale people often have social motivators whereas engineers find technical challenges motivating.

Summary

Motivation takes on a number of forms; from push motivators to the need for achievement. Motivation has a close link to emotions. Money, however, does not form a strong motivator in many countries but it can stand in for a number of other motivators such as holidays or buying a new house.

The Motivation Design

As a Technate will operate without money, the experts in various positions will need to give more thought to motivation. As money stands in for a number of motivators we will need a mechanism to replace the motivational aspects of money. This will mean greater emphasis on designing work and work places to motivate people and to fit people to work that they wish to do. Automation will help to some degree through removing less desirable occupations but we will still need to give consideration to how we design work. Research has shown a number of techniques that have some degree of success. However, not all methods work for everyone all the time. Therefore, work place design may need a number of complimentary motivational techniques. Therefore, design calls for making work personally interesting and stimulating for each individual; designing work around people, presenting them with challenges, opportunities for personal growth and mastery. Work should have the characteristic that people *want* to do the job rather than forcing people to work.

Examples

Robber's Cave

Muzafer Sherif and Carolyn Sherif conducted the Robber's Cave experiment in 1954 [Gross]. The experiment looked at conflict and friction with groups and showed how setting the environment and tasks for each group changed each group's motivation and altered the groups' interaction.

Goal Setting

In their work, Locke et al.[Locke] showed how goal setting can achieve higher performance through directing attention and effort. Goal can present people a clear challenge and opportunity to master something.

Motivation in the Technate

People have different interests and abilities. If we had a person who likes gardening for example, we would allocate gardening as a task for that person. They can remain in the position so long as it keeps their interest. That way a person gets to do something they like while making a contribution to the local group.

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Housing

Introduction

The design proposes replacing modern cities with an alternative called an urbanate. The Design does not layout a specific plan for an urbanate, but does layout some general requirements / characteristics. A urbanate should house a population of about 10 000. An autonomous community of about 200 forms the foundation building block for a urbanate, following the holonic concept.

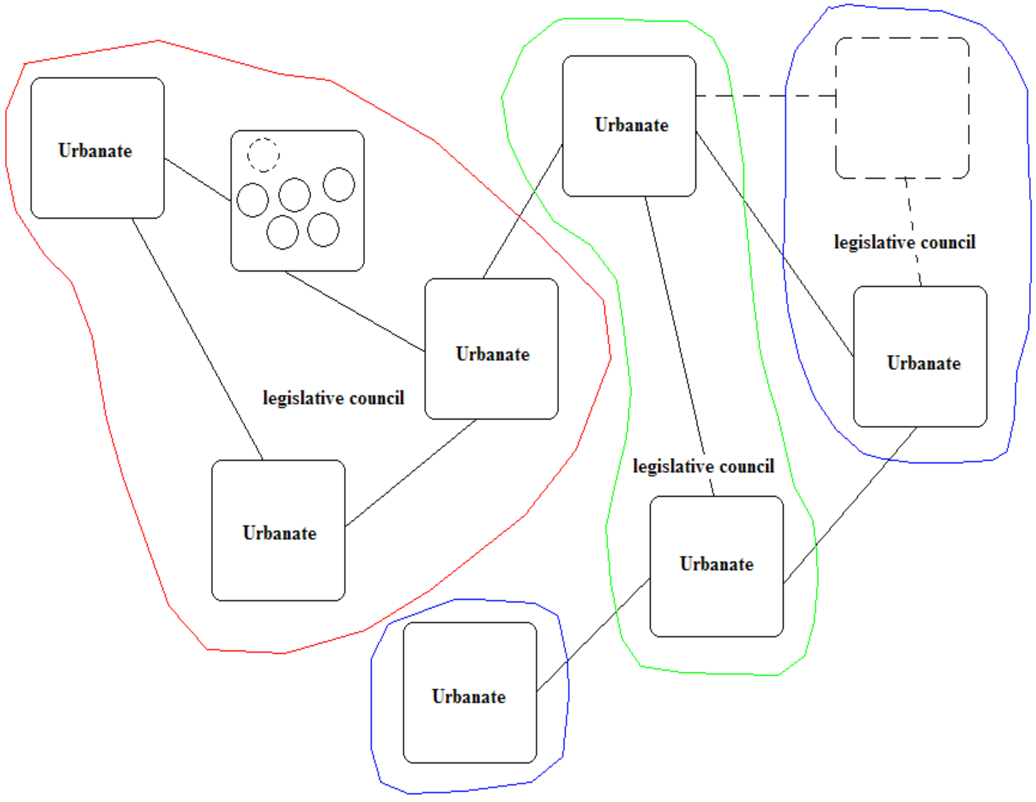

Figure A network of urbanates

Each community runs itself with its own elected form of government. Each community can then link up with the other communities in the urbanate to form a legislative council for the whole urbanate. As the Design allows for each community and urbanate to have self-governance the design allows for a great deal of diversity between communities and urbanates, allowing urbanates to take on their own character and support differ cultures (within certain limits). As such, urbanates with similarities can join together to form a network of urbanates with their own legislative council. The network doesn't have any limits as to geography so like mined urbanates from different areas can link together as they wish.

Overall Design Aspects for an Urbanate

The design for housing within a technate does not give a fixed plan for a specific formation of housing or a specific city design but does have several overall design specifications.

- Best Practice
- Modularisation
- Multiple Use
- Sustainable
- Circular Based
- Poly-culture
- Social Engineering through Environment Design
- Vertical (see "City Planning" on page 109)
- Local Characteristics and Adaptation

Best Practice

The design calls for a sustainable system thus "best practice" means designing for sustainability including minimising energy usage, designing for recycling and using nature to aid.

Modularisation

Building should have a modular "Lego" nature (like modern Personal Computers) to minimise wastage, energy and material cost and to make it easier to construct and repair and replace parts as need (for up grading for example).

Multiple Use

As much as possible we should aim to build public building so they can have multiple functions. A hall, for example, can function as a meeting place for a conference and then a theatre at night. The idea of multiple use follows from maximising the load factor; we aim to maintain 80% load for the technate so all system and buildings should find constant use for 80% of their capacity. So, buildings could achieve that through having multiple functions.

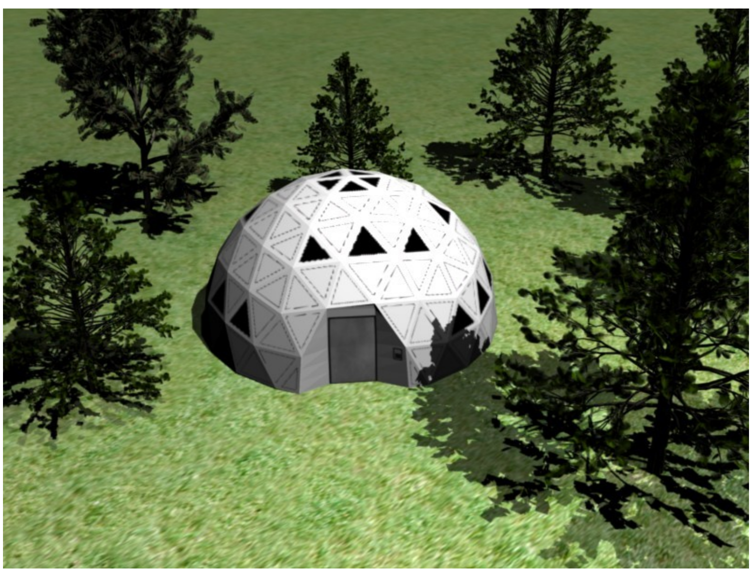

Figure A geodesic dome

Even personal homes could have multiple use. For example, a home can also function as an office.

Sustainable

Sustainability forms a central element to the design so homes should use the best practices for sustainability including materials used construction method. Each community within an urbanate would have systems to manage its own waste, energy production and food production (in cooperation with the other communities).

Circular / Triangular Based

Circle based structures such as domes have surface minimum area for maximum volume compared to other shapes such as oblongs. Thus, we expect domes and cylinder based buildings to form a characteristic of a future sustainable society. If we construct buildings close proximity to one another, the circular based shapes would change to hexagon based shapes.

Figure Inside a geodesic dome (photo: Stevekeiretsu)

In some situations triangular based structures such as pyramids may from the optimal structure for a building.

Effectively, whether circle based or triangular based the buildings could form a greenhouse which would allow plants to grow inside as well as containing housing.

Poly-culture

This refers to a mixture of buildings and greenery with some open spaces rather than a sterile cityscape. human beings evolved in a mixed wood / grassland environment that also had some water features. We should aim to construct environments that have a desirable nature for people and take into consideration that people have to live in them. Thus, a mixture of greenery, water features, private and public space would become essential ingredients in the design.

Social Engineering Through Environment Design

This includes designing for natural surveillance in an urbanate (such as having windows overlooking common area, mixed use areas and using lighting well), natural access control (such as one clear entrance to an area), providing trees and having well defined private and public area with high use of common areas [Newman]. The end idea has to do with designing environment so as to encourage certain behaviours and discourage others rather than trying to force people to behave in certain ways or having to evoke laws to control people's behaviour.

Vertical

Figure Vertical farms

We propose, in general, building urbanates vertical rather than horizontal. Urbanates would then forma layer structure within which we build housing, work, transport and recreation facilities.

Vertical construction aims to minimise land usage and our

figure a vertical urbanate

foot print on the Earth, which minimising our impact on the eco-system. However, vertical construction might have some problems as out lined in City Planning on page 109, which we will need to take into consideration and design for.

Local Characteristics and Adaptation

We expect each community and urbanate to have its own characteristic traits resulting from the autonomous nature and self-management of each community as well as its geographic location. Thus, we expect local adaptation to an urbanate design, rather than having "one size fits all". For example, urbanates in cold climates might have a more enclosed nature whereas urbanates in warmer, dryer, climates might have a more open nature.

Examples

This section presents some examples of some ideas that demonstrate some of the principles or guide lines for an urbanate

Eco-Units

The Swedish systems ecologist, Folke Günther first proposed this community design that emulate ecology [EcoUnit]. An eco-unit occupies an area of about 50 ha and has 150-200 inhabitants. It produces its own food and uses natural systems to process waste material such as a grey water system that filters the water through a network of ponds and plants. The eco-unit then recycles nutrients within the system and produces all its own food locally. The eco-unit also maintains its own energy supply.

This could then form the foundational building block for an urbanate, perhaps through layering rather than building out wards.

Sky City 1000

The Takenaka Corporation in Japan originally proposed Sky City 1000 for Tokyo. A number of "bowls" called "Space Plateaus" in layers would form a tower 1 km high. Each space plateau would house housing, workspace and recreational facilities in a mixed environment of building and green park space.

Sky city forms an example of a mixed used environment in a vertical construct.

Pyramid City

Pyramid City forms another example of a vertical, multi-purpose, city building. Also designed for Tokyo, Pyramid City has inbuilt transport facilities with housing, work and recreational areas in five layers.

Figure Arcosanti (photo: Chris Ohlinger)

Arcosanti

Built in the desert in the US (and still under construction), Arcosanti represents another combination of architecture and ecology (archology). Built to minimise resource usage and give people access to nature the city forms an example of possibilities for an urbanate.

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City Planning

There are some general issues with current city planning that will have to be taken care of in a future technate. These issues include changes in hydrological regimes, i.e. increased runoff, decreased infiltration and evapotranspiration. As well as impacting nature greatly, by expanding further and further into natural environments. Modularity is also an issue with current city planning.

The city should be a future sustainable living environment with minimum impact on natural systems. This chapter focuses on land based urbanates.

Introduction

Cities today expand as new buildings are needed. This poses some issues; (1) cities are constantly expanding outward, (2) New roads have to be constructed and updated at regular intervals, and last but not least, (3) cities and towns are very rarely designed as effectively as they could be.

Road and building construction greatly affect hydrological regimes, which generally causes decreased groundwater flow, and has the potential to damage structures, due to subsidence (Lundmark 2001; Strahler & Strahler 2005). This also causes increased runoff which increases the risk of floods (Lif 2006) and damage following.

Designing the system so that the entire population of an area are voluntarily moving to a big city or urbanate would be the most sustainable long term alternative to our current system. One of the greatest problems that arise when planning something like this is the general lack of viable ways to grow crops and farm animals (when it comes to farming animals, one could argue that this is not sustainable in itself, however, this would be the subject of another article). I'll be discussing ways of solving this issue below.

Building a Safe Future Urbanate

There's a lot of buzz in the technocratic world about sky city (which comes in a variety of shapes and sizes, see Figure 15 for an example), vertical greenhouses and the like. I agree that the vertical approach is one of the most sustainable and efficient designs, but as with everything else it comes with its issues.

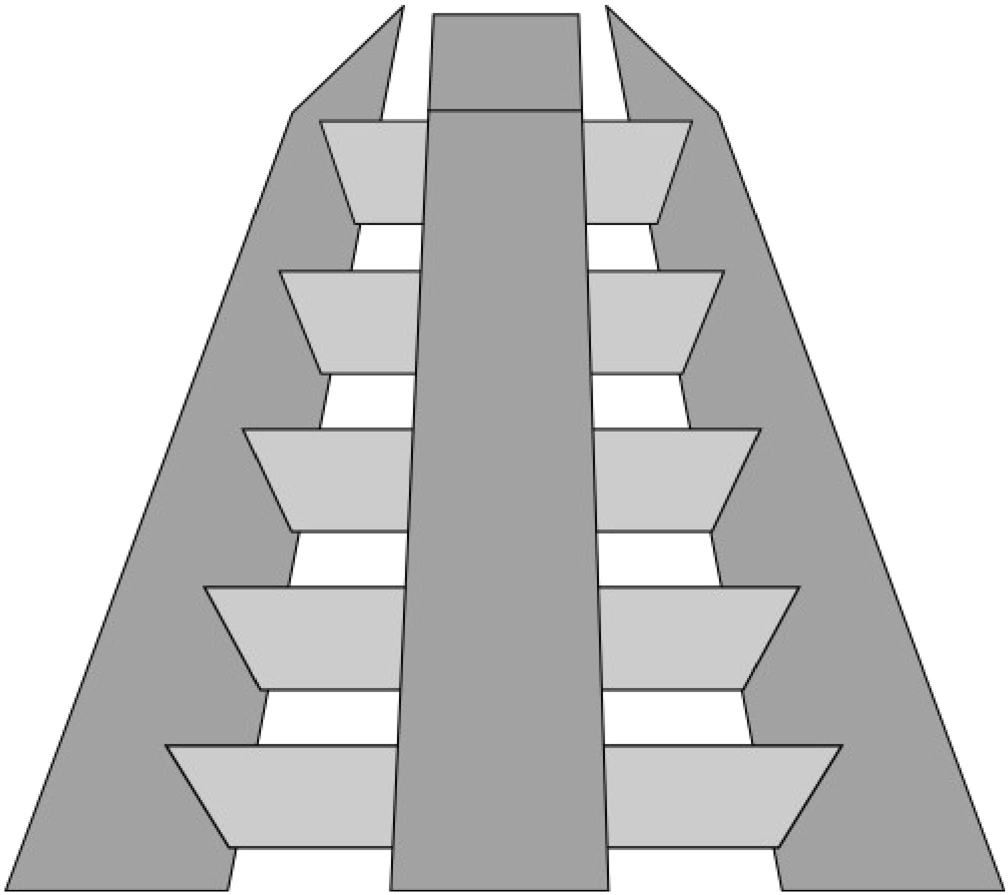

Figure Rough sketch of a popular sky city design

Light-grey areas show levels of the city, while darker grey areas make up the support structure, and provides transportation between the different levels.

Effects on hydrological regimes and what must be kept in mind

I can't stress enough the importance of carefully studying the impact on hydrological systems before even considering construction of any kind in any area, this especially applies when constructing something as vital as an entire vertical city.

Today, construction companies and governing agencies have a tendency to disregard warnings and recommendations issued by geologists with a general “let’s take it as it comes” attitude (The Hallandsås Ridge Tunnel Project in Sweden being a prime example). This may or may not be the case in a possible technocratic future, governed by science, but it is an issue that in either case must not be ignored.

As before mentioned, hardened surfaces, such as roads and buildings have an effect on ground water flow, which may cause subsidence and thus potential damage to structures (Lundmark 2001; Strahler & Strahler 2005). Pumping of waters (drinking water for example), can have the same effect, with severely lowered ground water levels localized around the well (Grip & Rodhe 2003; Strahler & Strahler 2005). This something that must always be kept in mind when designing a sustainable and safe urbanate.

Precipitation and Sky City, a Potentially Hazardous Combination.

As before mentioned, hardened surfaces causes an increase in runoff (Lif 2006). In current cities this can cause floods of different magnitude (Lif 2006). This may well be a problem in sky city, however vertical construction of cities pose even greater problems with precipitation.

The vertical nature of a sky city means that water flow from rain will be concentrated outward, toward the edges of the city, causing increased erosion of the soil surrounding it, which may well prove dangerous to city integrity. I'll present possible solutions to this issue below, all based on drainage systems:

1. Drain the water from each level out from the city, into a stream. This however means that in periods with high precipitation, water flow in this stream may greatly increase and affect nutrient retention and sediment transportation. Which could have a negative impact on biological systems both in the stream itself and to land based ecosystems close to the stream. Also, unwanted harmful or even dangerous chemicals could follow the water into the stream.
2. Drain the water out into the surrounding area, spreading the drained water out over a larger area. This may however (in large flows) cause erosion of the ground, which could drain sediment and humus from ground based ecosystems into nearby streams. This is an issue even today, when flooding occurs in managed forests (Lif 2006).

3. Drain the water into the groundwater, for later use as drinking water.
4. Store the rainwater in tanks for later use in irrigation systems, or as drinking water.
5. Attempt to mimic natural processes following precipitation. By allowing some of the water to infiltrate into the ground, some runoff and some evaporation (Grip & Rodhe 2003).

Number 4 is probably the most logical choice, as it would minimize the work needed to provide water for crops in some areas. However, at very high downfalls it may not be possible to store all of the water, not unlike in regulated streams today (Utredningen om dammsäkerhet och höga flöden 1995), which may pose a problem.

Alternative urbanate design.

With my previous points in mind, perhaps a vertical city is not the best option available at all times. In the Figure ”Alternative urbanate design”, I illustrate a possible alternative to the vertical approach.

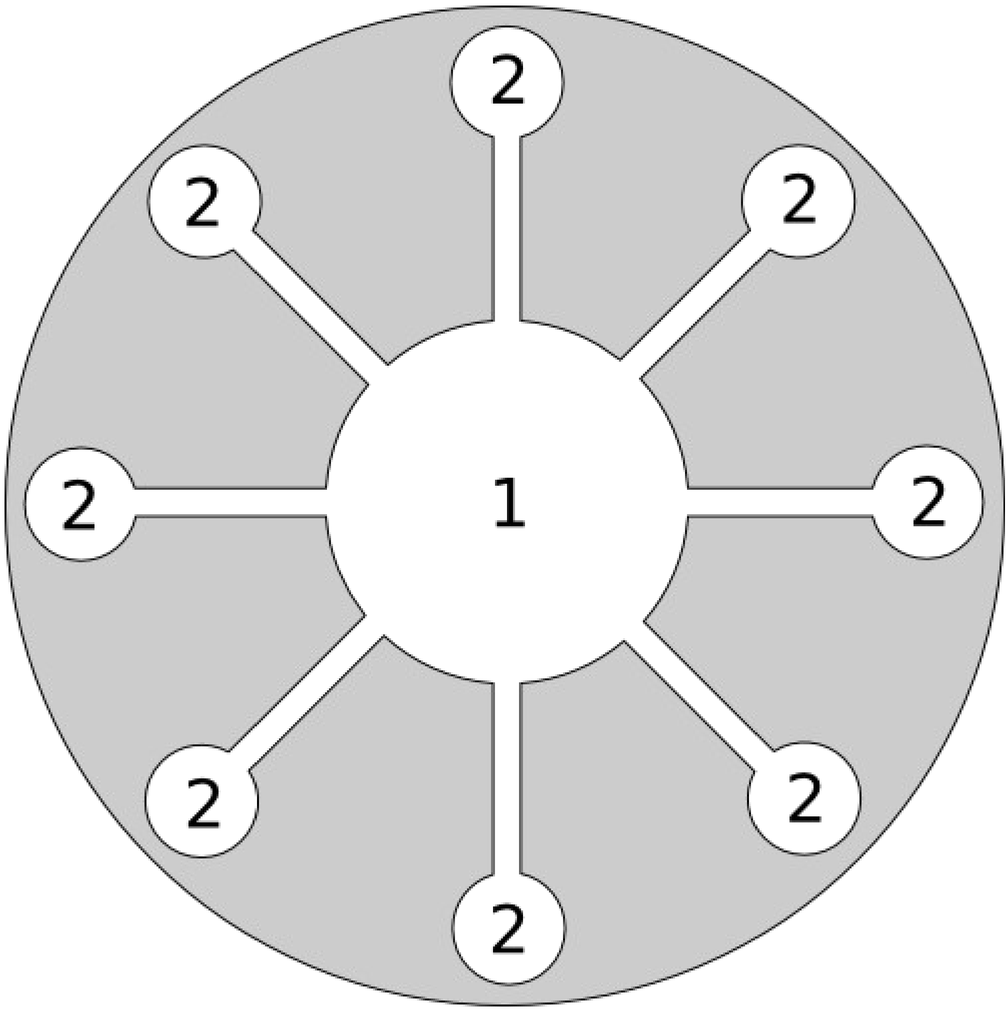

Figure Alternative urbanate design

(1) depicts a central area where production is done and transportation is rerouted. It is surrounded (2) by smaller living areas. Lines connecting (1) and (2) describe transportation routes. The grey area in the void between areas represent managed forest or crops

The strength of this approach is that transportation of crops is minimized. It also allows for forest management in an area that should be sufficient to sustain the entire urbanate (and then some) and also allows for semi-natural environments that inhabitants can visit recreationally. Transportation within this urbanate is of course done via rail. Keep in mind that this approach requires a substantially smaller global population that we currently have, however, population management is not the subject of this article.

This design also spreads out the effects on groundwater flow over a greater area (and the surrounding forested area allows for infiltration), which should dampen its negative effects.

Modularity in the Urbanate

An issue with current building and technologies in general, is that structures have a hard time keeping up with advancing technology and new environmental strategies. If a building is deemed too old (or damaged) for use its generally cheaper to rebuild the entire building from scratch. While this may be a financially sound strategy, it has no place in an environmentally friendly society.

Future structures should be constructed with modularity in mind, some examples:

- Easy access to wiring to allow for simple upgrades and fixes. This should also allow workers to easily add new cables, to, for example, tie the entire building into a network and easily expand the network into new building compartments.
- A "Lego-design" that allows parts of the building to be detached and repaired/replaced, without affecting functional parts.
- Movable buildings, in order to maximize the efficiency of the city design, buildings should have the ability to be easily moved from one position to another.

Global transport networks

Roads connecting cities and other areas have an adverse effect on natural environments, since they cause fragmentation of habitats, which can have a negative effect on species diversity(Berglund2004; Groeneveld et al. 2009; Begon et al. 2006; Campbellet al. 2009).

Since I expect cars will have lost their usefulness in a future technate (perhaps with the exception of some remaining terrain-vehicles used for scientific research), an inter-continental rail-way seems like it may be the most promising way for individuals to travel between different areas.

I would suggest that the railway is raised off the ground, to allow animals to pass under the rails, this to avoid fragmentation, and to make travel less dangerous.

Conclusion

Properly designing future cities will be an important task for future engineers. With this article I hope to have made clear that no single design is optimal for every single area. When selecting an approach the following points should be carefully considered (in no particular order):

- Climate.
- Population size.
- Geological aspects.
- Sustainability.

The strength of technocrats is that we base our decisions on knowledge and logic. I hope to have made an impact on the readers of this article and that I in some way affected the way buildings and cities are constructed in future urbanates.

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Technology

The Design calls for a hi-tech sustainable society. This chapter looks at some of the technology we would need to meet the overall goal.

Transport

We might still see the personal car in our future but we envision a society where we do not need such vehicles. Urbanates would have transport structures integrated, negating the need for personal transport vehicles. We also see the use of monorails, which can offer high speed transportation from urbanate to urbanate replacing air travel.

Figure A monorail system would allow us to replace roads giving the land back to nature (source: http://www.transfuture.net/)

Energy

The Design calls for a two pronged approach to energy; sustainable production and reduction.

Energy production would centre around sustainable technologies such as wind, solar, bio- and geothermal. This would take on local adaptations with perhaps a solar dominating latitudes close to the equator and wind becoming more dominant as we head towards the poles. We have the technology capability of producing all our energy needs from sustainable sources [JacDel].

We also aim to reduce our energy consumption to minimise the amount of energy that we need. We can achieve this partly through design for efficiency but also through the reducing the need for energy such as reducing production through elongating items life expectancy and reducing the need for people to travel.

Agriculture and Food Production

In keeping with the vertical idea we envision more local vertical farming as part of an urbanate so the communities would grow their own food within the urbanate. This localisation would cut down the need to transport goods from distant places.

Figure Vertical farming

Photo: Cjacobs627 at en.wikipedia

Hydroponics forms one way for us to grow food in vertical farms as well as in underground farms. The stacking of crops allows us to produce more food in a given area when compared to traditional farming with less pests or need of pesticide. We can also grow crops in climates we not normally have the ability to which means less need to transport food around the world. Such farms also lends themselves to automation so we can reduce the human labour needed to maintain such farms.

Figure Hydroponics

Photo: NASA.

Automation

Automation forms a key part of our vision for the future. Factory robots can build much of what we need and transport robots such as AGVs (Automated Guided Vehicles) can move items where we need them; anywhere world around any time. Automation means we can reduce the amount of work people do and thus give more people more time to be human.

The term *automation* refers to the process of using cybernetic systems, such as control systems, Artificial Intelligence (AI) and Information Technology, to reduce the need of human labour and to aid decision making. The Design for a future sustainable society calls for the use of automation both to reduce human labour through removing the dull and uninteresting physical work needed and reduce the dependants on human labour. The remaining tasks needed within in a technate will then have a more interesting and challenging nature.

Current technology can already meant much of the requirement so it comes down to application although we might need some development work to reach full automation.

The design specification, therefore calls for the increased use of automation to replace human labour as much as possible.

Automation can fall into two groups:

- Static systems
- Mobile systems

Static Systems

This includes automated production machinery such as CNC machines and industrial robotic arms but also includes devices outside of manufacturing such as thermostats used to regulate heating in a home, for example.

We already have a strong technological bases for the automation of much work and have the capability for fully automated factories. Examples include:

- Robotic arms
- Automated machines
- Machine vision systems
- Telerobotic devices

Robot Arms

The term *robotic arm* refers to a flexible multi-join programmable manipulator that resembles a human arm. Such machines find a use in manufacturing doing tasks such a pick and place, welding or assembly. They come in a number of type of constrictions such as :

- Cartesian coordinate
- Polar coordinate (including SCARA robotic arms).

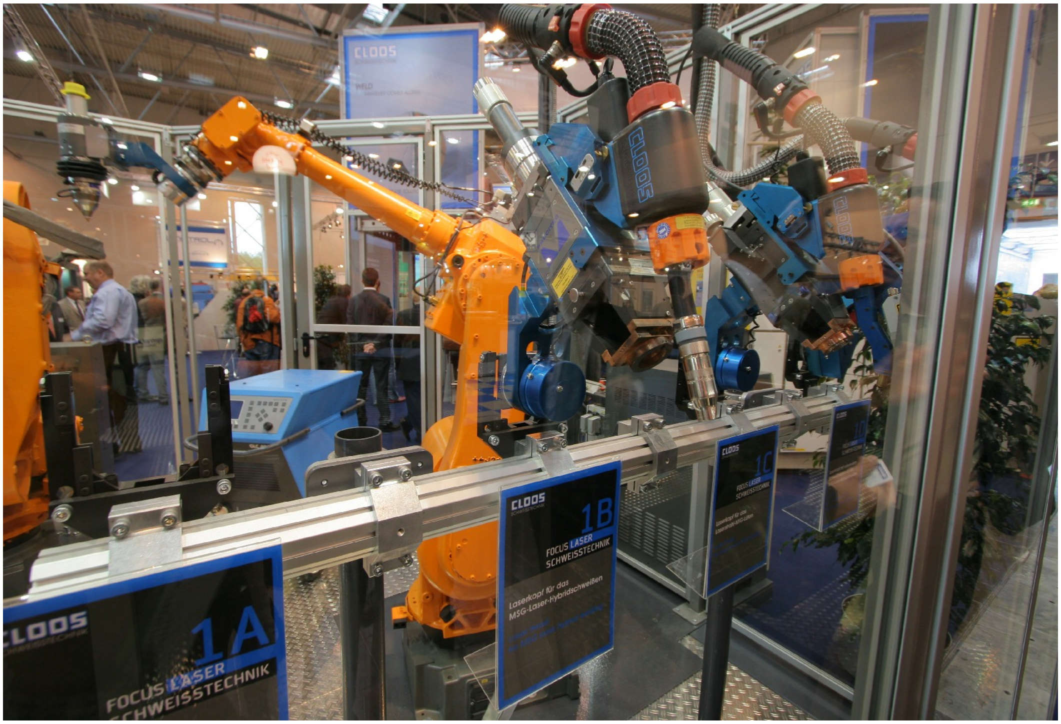

Figure Robot arm at work

Photo: Pipimaru

Automated Machines

These include CNC machines but could also include such machines as washing machines. They lack the flexibility of motion of a robotic arm but still have the programmable nature. A CNC machine, for example, has application to various drilling or milling tasks. We can also use 3-D printers to manufacture many items.

Machine Vision Systems

Such systems consist of cameras or light sensors and have a use in quality control, security, safety and tasks such as reading data or information. Examples include postal systems that read addresses from envelopes.

Telerobotics Devices

The term *telerobotic devices* refers to robotic like equipment that has a human operator such as the space shuttle robotic arm. Such devices have a use in dangerous or difficult environments which falls beyond the current level of AI and therefore, requires a human operator. Such devices find applications in space but we could also use them to reduce the human work load in less desirable environments such as mines.

Mobile Systems

Mobile robotic systems fall into one of two types :

- Autonomous vehicles
- Automated Guided Vehicles

Autonomous Vehicles

Autonomous vehicles can operate for some time without external intervention. Such examples include planetary rovers.

Automated Guided Vehicles

Automated Guided Vehicles (AGVs) have some kind of external intervention that directs their motion. for example, factory AGVs often have wires embedded within the factory floor for the robots to follow. As a result, AGVs often have less need for AI than autonomous vehicles.

Figure An Automated Guided Vehicles.

Source: wikicommons

Artificial Intelligence

The term *Artificial Intelligence* (AI) refers to automated problems solving using machines; the attempt to create machines that can act autonomously in the world. We expect AI to run much of the decision making on the technical side of a technate. AI falls within two categories:

- Symbolic reasoning systems
- Behavioural based systems

Symbolic Reasoning Systems

Symbolic reasoning systems encode sensor inputs and uses a process of formal logic to manipulate the encoded patters to produce an output. Such systems form the dominate method of AI to date. Within this method we could include examples such as rules based systems or case based systems and fuzzy logic. Such systems tend to work well for long term planning problems.

Behavioural Based Systems

Behavioural based systems react to sensory input without encoding it. Such systems work well for sort terms action such as avoiding obstacles in mobile robotics.

The Use of Automation

- Automate factories. Factories should use automatic production as much as possible. We already have the capability to achieve this through the use of robotic and automated systems as well as the application of AI.
- Automate transport systems. Using AGVs or even automated vehicles we have the capability to fully automate all transport systems from the transportation of goods using ships and lorries to the automation of the postal system.
- Automate the home and office. We could reduce the amount of work conducted in the home or office environment thought the use of small scale robots to clean and transport items (such as post).

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Proto-technate

The term **proto-technate** refers to an experimental platform for experimenting with the Design and a means to move from today's unsustainable sociality to a future hi-tech sustainable society. A future hi-tech society can take many forms and a proto-technate (or full technate) exemplifies one such form.

The *Technate* refers to an operational area where experts manage the technology within that area. Such an area has no nations nor uses money. Technocracy Inc. in the US originally proposed the idea in the 1930s. A proto-technate then forms a step between a full technate and today's society as it partially uses money and works within the current socioeconomic system.

A Proto-technate as a Network

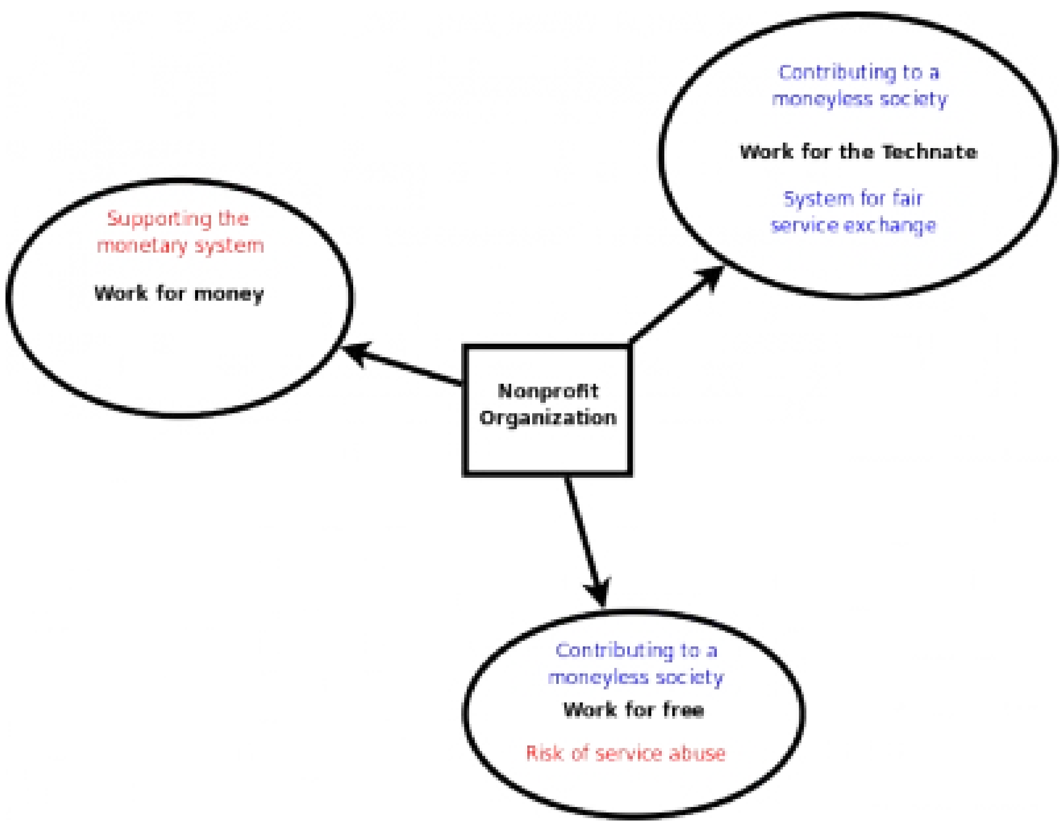

Figure NPO work options

A number of building blocks form the foundation for a proto-technate. Not for Profit Organisations (NPO) such as companies and communities form examples of these building blocks. Each building block works autonomously but forms part of a network. The communities form the central core of the network with the companies forming the interface between the core communities and the outside world. The system, thus, works as a P2P or holonic network with each part of the network working on its own goals but contributing to the overall goal. Internally the network does not use money. Each NPO effectively provides services for other NPOs within the network to the best of its ability for free. However, the network should use some means of resource allocation, based on energy accounting. Externally, the network works like any company in operation today, buying, selling and proving services as any other company.

An Example

A small start-up network consisting of:

- A web design company
- A computer hardware company
- A translation company

The web design company provide web design services to NPOs in the outside world for a cost but could also provide web designs for free to those inside the network. The computer hardware company provides servers for web hosting. The company would charge for serves provided outside the network but could host websites for free for those inside the network. The translation company offers translation services at cost to those outside the network but would offer free translation services for those inside the network.

The web service company could design a web site for the translation company, hosted on the hardware companies servers and then the translation company could help translate web sites for the web design company and help with advertising for the hardware company.

As each company interacts with the world outside they still have to make sufficient money to keep the company going so the services provided internally have a limit. An NPO can't provide services if it prevents the company from making sufficient money to keep going.

As the network expands, more companies become part of the network and the network provides more services for its members. As the network becomes larger, we can add sustainable communities to the network. Each community would provide members who would work for the NPOs and in return the network would provide housing, food, and other goods for a good standard of living to the members of the community (no money used internally).

Goals and Communications

As the network has a composition based on autonomous NPOs it needs a method to maintain the network. The use of goals and channels of communications forms such a method. The network has an overall goal of the *highest standard of living for the longest time possible* but each NPO or holon within the network can work towards its own goals so long as those goals have a good degree of computability with the overall goal. As a network consists of arcs and vertices the proto-technate has NPOs as vertices but also maintain communication channels as arcs. To form part of the network, each NPO must maintain a communication link with at least one other NPO and there must exist a path directly or indirectly from any given NPO to any other NPO.

Classes, Principles and Tags

As the network works towards a goal we can define any number of networks through a reference to the network's goal. To enable NPOs to know what goals the network(s) it belongs to has each NPO can use a system of principles, classes and tags. A principle defines what the NPO does or what standards it adheres to. For example, an NPO could adhere to a principle of equality or of diversity. A class represents a collection of principles that defines the NPO and through knowing a NPO's class other NPO can decided to accept the NPO as part of the network. When an NPO accepts a principle or class it tags that class through adding a PGP signed tag so other NPOs can see that the NPO has accepted the class or principle.

Roles within the Network

As part of maintaining the network we have three roles defined for people within the network.

- Directors
- Coordinators

- Project leaders

Directors

Directors have the roles of maintaining the goals and communication channels in the network. For each NPO to join a the network, a director must approve its goals. If the NPO carries out activities incompatible with its goals a director can remove the NPO from the network. The director also has the responsibility to ensure that each NPO can communicate with at least one other NPO. However, a a director can not interfere with the internal running of each NPO. So long as the NPO carries out activities compatible with the overall goal, the NPO decides how it carries out its own activities. Also, so long as the NPO can communicate with another NPO, it's up to the NPO to carry out communications if it so wishes.

Coordinators

Coordinators work within each NPO to aid cooperation between NPOs. For example, that can communicate with other NPOs on a regular basis and if they find a project of common interest can propose to the NPOs involved that the work together. Also, through maintaining an awareness of the activities of other NPOs they can advise if one NPO starts working on a project that another NPO has already started.

Project Leaders

Internally, each NPO carries out work within projects. Each project then has a project leader who manage the project. How each NPO works remains the responsibility of the project leader and so long as the project has compatible goals, the project runs with no external interference under the full authority of the project leader.

Higher Layers in the Holarchy

Each NPO works autonomously on its own projects. However, some projects becomes too large for each NPO and they need to cooperate with other NPOs. When such cooperation becomes necessary, the NPOs form another NPO to manage the joint project. The higher NPO manages the overall project and the lower NPOs manage sub-projects. As each NPO forms an example of a holon, the layering of NPOs becomes a holarchy. The following forms the layers of the holarchy :

- Groups - the lowest level of the holarchy
- Zones - Groups level NPOs can join together to cooperate on larger projects forming another NPO to manage the larger project. The higher level NPO then becomes a zone NPO.
- Areas - Zone NPOs can join together to form area NPOs for larger projects.
- Sector - Area NPOs join together to form Sector NPOs.
- (Proto-)Technate - Sector NPOs join together to form the highest level of the holarchy that manages projects that cover the whole operational area.

The Hierarchy of Sequences

On top of the holarchy exists a hierarchy based on technical areas such as research, agriculture, aerospace or transport, called functional sequences. This structure forms the monitoring and maintaining structure for the holarchy and has a composition formed of boards of directors. Each level of the holarchy has a board associated with it. Each person within each NPO has membership of a functional sequence as can appoint a direct at their level. So, each member of each sequence can appoint a director such a s members of the group level sequence of research can appoint a group director of research. The director then has the responsibility given above.

Energy Input labelling

Abstract

The goal and scope of a project to develop an Energy Input Labelling (EIL) program is discussed. Case studies involving a food product, retail product and service are described. A challenge to energy input labelling is identified and overcome by adoption of energy added input labelling rather than total energy input labelling.

Introduction

The Energy Input Labelling (EIL) Project is one of several new endeavours originating from the August 2005 North American Technocracy Conference held in British Columbia, Canada. The goal of the project is to study and develop a potential program in which producers of consumer goods and services reliably calculate energy inputs into their products and then report that information on their product labels.

EIL reports energy inputs, but not energy content. Energy inputs refer to how much energy was used to produce a product. Energy content refers to how much energy a product presently contains. These quantities can be quite different from each other. The same energy might have been used to mine a cubic meter of lead as uranium. So then, the energy inputs for both of those metals would be the same in this hypothetical example even though uranium typically contains much more energy than lead.

1. Several case studies have been conducted. One such case study involved a local bakery. This is an important example, because baked goods are extensively consumed and are typically still made in North America. In fact, bread and other baked goods are the most fundamental and indispensable products of western civilization.

2. Another case study involved printing and assembling a commercially available book. Nonprofit organizations are some of the potential early adopters of EIL, and many of them publish booklets. In fact, this case study will help Technocracy, Inc. to adopt EIL for its own publications. Numerous commercial manufacturers also include instruction booklets with their products, so they can perform a proof-of-concept for EIL with their booklets.

3. A third case study involved a computer database consulting service. Services can be energy input labelled, so it was important to include a service-oriented case study. Of course, manufactured goods also involve labour, but the calculations are more direct for labour used to produce services.

Method

Onsite visits and interviews were utilized to gather data regarding equipment usage, batch times and other parameters. Data gathered from the case studies has been inserted into our templates to create initial energy input figures.

The project team utilized the case studies to develop methods for gathering data and calculations to determine energy inputs. The project team has developed initial templates and standards for calculating direct energy added, distinguishing between single versus batch production and multiple product lines. These templates and standards are in the form of electronic spread sheets and can be used by any business or organization.

A significant challenge has been how to develop a method that comprehensively and accurately measures energy inputs, yet is simple enough for small businesses to enthusiastically adopt. After an initial investigation, we changed our methodology to calculate and label the energy added inputs rather than the total energy inputs to produce a good or service.

Energy added includes electrical power, gas or other energy used by the producer to power production machinery such as lathes, ovens and printing presses. It can also include the calories burned by the bodies of humans during production labour. Air conditioning, ventilation and lighting energy can be included if such can be measured and allocated to units of product. Producers can themselves measure energy added, so that they can have strong confidence in that measurement and are more likely to label it. Note that our project only considers physical units of energy used such as: Joules, BTUs, etc but not their monetary cost.

Conversely, total energy includes upstream energy inputs utilised to produce raw materials such as wood, flour and paper. Producers of consumer products typically purchase upstream inputs from outside vendors, so energy inputs of upstream parts and raw materials are typically unknown. Likewise, total energy would also include energy inputs required for labourer housing, facilities, government-provided infrastructure and numerous other inputs that cannot be readily allocated to a particular producer. Rough estimates of total energy inputs are possible, but the margin of error would be large until significantly improved data and calculation methods exist. In the future, as more producers adopt energy labelling and as methods improve, it may be possible to deduce accurate total energy required inputs by summing up the energy added by each firm in the production chain.

To encourage uniformity in EIL, the project team drafted initial energy input labelling standards. A brochure has been developed for circulation to both consumers and producers. The project team has researched and developing a certification and monitoring process but may reserve these steps for a future project.

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Accountability System Within a Technate

Abstract

A system of accountability is required within the Proto-technate and the Technate to ensure that it can function properly as it grows. This chapter suggests the use of a system of "Principles and Classes", which is a form of direct democracy that allows all members of a society to contribute to the principles of operation to be followed within it. It is expected that this system will have a positive influence on society both by increasing independence and having some positive psychological effects. The article also presents a practical implementation and has many loopholes already corrected, though further work may be required to make the system more usable and safer.

Introduction

Any group of people working together towards a common goal, need a relationship of trust in order to be able to cooperate. This relationship of trust requires an agreement, or a mechanism to ensure that all participants are going to abide by some shared set of rules, which ensure that people do in fact cooperate and don't do anything to harm each other or the goal they are pursuing[1]. This mechanism is generally known as accountability, a system of responsibility which ensures people abide by a set of rules or face the consequences. [2]

A Technocratic society is not exempt from this requirement. While we do not believe it is the role of Technocracy to dictate how people should live, we do recognize that any society, including a Technate, requires dependable agreements between people in order to be able to operate and cooperate. This article presents a system dubbed "Principles and Classes", which is a form of direct democracy, that people can use in order to define, redefine and act by these rules, without the need for an elected leader.

Part 1 - Terminology

The system is developed as the smallest common denominator that fills the requirements explained in the introduction. We use the following basic concepts, with the following terminology:

- **Principle**: A description of a goal people set for themselves, may be achieved or not. For example: "Principle of free speech: Everybody has the right to express their opinion"
- **Class**: A group of principles and/or other Classes. For example: "Class of open source: Requires Principles of Free Redistribution, Supplied Source Code, Allowing Derived Works, Integrity of The Author's Source Code, No Discrimination Against Persons or Groups, No Discrimination Against Fields of Endeavour, Distribution of License, License Must Not Be Specific to a Product, License Must Not Restrict Other Software and License Must Be Technology-Neutral."
- **Tag:** A signature associated with a Principle or Class and person or organization, which indicates that this person or organization approves of this Principle or Class. For Example, this could be a digital signature applied to a unique identifier or full text of a specific Principle.
- **Impartial Observer**: A person who serves as a judge to determine what Principles and Classes are being met. In a Technate or Proto-technate, this person is the Sequence Director.

Part 2 - Mechanism of action

1. Any person or organization can define new Principles or Classes.
2. An Impartial Observer periodically assesses people and organizations to determine which Principles and thus Classes they have already reached, and which they have not.
3. Any person or organization may specify Principles and/or Classes to be used as criteria on which people and organizations are allowed to cooperate with them. If a person or organization does not reach the Principle or Class required by this person or organization, according to the Impartial Observer, they may not cooperate or use each other's services in any way.

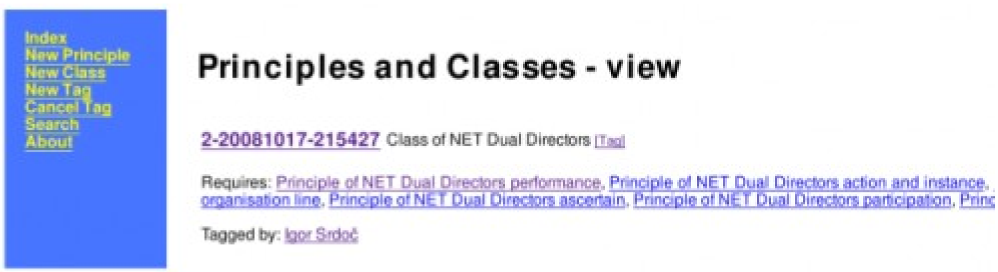
Part 3 - Effects on society

The presumed effects this system would have on society are that it would allow people to directly define what rules exist within their society. More-so, it would not be a "rule of the majority" system as it would allow people to form separate groups with different rules within the overall system. Any group with a population large and diverse enough to sustain itself could exist within such a system. On the other hand, no group with insufficient population will be able to force other groups who do not agree with it's existence to sustain it.

It is expected that Principles and Classes which will be poorly defined, when a better alternative exists, will not be widely adopted and will thus phase out eventually by themselves.

Also, defining the Principle as a goal rather than a rule, removes some of the negative stigma associated with the "nonconforming". Where there is a typical system of Law, laws are rules to which the majority of the population conforms[3] and a clear distinction is made between people who abide by the law and people who do not, in a system of Principles, nobody conforms to all Principles and striving to do so is an on-going process for everybody.

Part 4 - Structuring and formalization



Example of a Class

The reason for the existence of Classes and Tags is simplification:

- **Classes:** Where Principles are simple, clear, and often single-sentence definitions, there could possibly be hundreds or maybe thousands of Principles that make up a single topic such as for example "Hygienic production of food". In order to help prevent situations where a person or organization would have to find each of them to properly specify what they expect, Classes can be used to hierarchically combine Principles, ending with for the former example "Class of Hygienic production of food".

- **Tags**: However, both Principles and Classes may be replaced by better ones in the future, therefore some selection needs to be made by some authority. Since nobody is universally qualified to be this authority, anyone may be one, all that is required is that this person or organization is uniquely identified and that its approval of a specific Principle or Class as "new", "proper" or "better", cannot be forged by a third party. For this reason there are Tags. A tag is a digital signature of the selected Principle or Class. This tag may be removed at any time, but only by the same person or organization.

Further formalization is required in order to prevent abuse:

- **Serial Numbers**: Principles, Classes and Tags are typically identified by name (for example: "Principle of personal freedom"). However, since anyone is free to provide a new Principle, Class or Tag, someone may create another one of the same name, either accidentally, or with malicious intent of deception. To prevent this possibility, a system of unique identifiers is devised. Each Principle, Class or Tag is given a unique serial number and nobody may change the content of an existing Principle, Class or Tag, without also updating the serial number. This serial number is defined as: Every serial number should be in the format X-YYYYMMDD-HHMMSS, where X is 1 if it's a Principle, 2 if it's a Class, or 3 for Tag and the YYYYDDMM and HHMMSS are the time at which the Principle, Class or Tag was written or finished. No two Principles, Classes or Tags may be specified in the same second. Whenever another Principle, Class or Tag is referred to, for example in the definition of a Class or Tag, the serial number must be used.

Part 5 - Practical implementation

A practical implementation of a system which allows the authoring and storage of Principles, Classes and Tags, by the aforementioned system can be found here:

- http://standards.ctrl-alt-del.si

The implementation is designed to function in such a way that it can be used by anyone, not only Technocrats, to define the rules of operation within their society, therefore the Principles and Classes listed within the implementation are not necessarily ones approved of by EOS.

The implementation provides access to individual Principles, Classes or Tags text, including all the relevant links, as well as facilities required to enter them. The implementation also provides RSS feeds of Principles and Classes tagged by a specific person or organization, by the digital signature's fingerprint, intended to be embedded into remote websites. The implementation's source code is available on the site.

Conclusion

While the theory itself is sound, further simulation may be required to ensure that there are no exploitable faults. The use of the Sequence Director for the Impartial Observer may be problematic, primarily because it may be hard to tell if (s)he is truly impartial and also because of the sheer amount of work to be done once there are thousands of Principles and Classes to be checked on a total population of a Technate. Study on the possibility of atomisation is under way.

Also, the adoption level of the implemented system was very low, indicating the unsuitability of the system for small organizations, such as the ones it has been presented to thus far. Small organizations tend to function by verbal agreement and subjective determination of trustworthiness and do not need to document their principles of operation or have explicit mechanisms to ensure compliance. Further work may be required to make the system more convenient.

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2. Schedler Andreas: The Self-Restraining State: Power and Accountability in New Democracies, Conceptualizing Accountability (1999), pages 13–28, ISBN 1555877737
3. Georgiadis, *General Principles of Civil Law*, 19; Washofsky, *Taking Precedent Seriously*, 7

Error Correction

We cannot call any system perfect. Mistakes can happen, any system that relies on people can go wrong and unexpected events might happen. Therefore, we would need some correction procedures. Openness and Peer review forms part of the application of science and they act as correction procedures. This chapter looks at other aspects that we can use. The philosophy behind the correction within a technate we can sum up as "fix the problem not the blame".

General Error Correction

When a problem occurs we should analyse it and try learn from it; what when wrong? Why did it go wrong? We should also analyse possible solutions and see how we can make the situation better. We may not have the ability to solve the problem but we could minimise the effects and perhaps have automatic correction abilities.

When we have a possible solution or set of solutions should aim to test them out. We would need to avoid implementing a solution that solves one problem and causes many more. Therefore, we need to verify that present solutions will solve the problem without making other parts of the system worse. We also have to verify that the solution has some value in doing.

Correction Procedure for a Holon

The holonic structure has a dynamic nature; holons can come and go as needed. If we reach a situation where a holon no longer functions correctly we can remove it from the system. We can do this in a number of ways. If a holon no longer functions correctly but we still need the task done we can establish another holon and close down the faulty holon. People working within the system have the option to create holons as the need arises. As a holon no longer has a need holons will close down and people working within the holon move to other positions.

Correction Procedure for Communities

Communities can potentially have their own form of government or they can form part of a larger government as they wish. Correction procedures their become dependent on the type of community government. A direct democracy community for example, elected to remove legislative members.

Correction Procedures for Experts

Directors, project managers and other people in such positions on the technical side we can removed through a process of peer review. As holons on the technical side have an openness attribute which means other experts can review the work which a holon conducts as well as review the work of the directors. If a group of experts feels that some other experts have not done their job correctly they can propose to review the work done. If they find the work not up to standard they can vote to remove the person from the position.

In this correction procedure, experts can only remove a person in a position on the technical side for ***technical reasons only***.

Appendix - Implementation Details

The Transition Plan – Stepping Stones

Introduction

How do we move from today's unsustainable money based socioeconomic system (A) to tomorrow's sustainable money-less socioeconomic system (B)? This article presents EOS's proposal for answering that question. Our transition plan focuses on a set of stepping stones that move us in the direction of a sustainable money-less socioeconomic system. The first part of this article presents the starting point; what we have today. Then the article gives a brief outline of the network we envision as both an experimental platform and as the beginnings of a new civilisation. The article then looks at the stepping stones and the problems we might encounter. The next section then looks at what we have done so far.

The Starting Point

The transition plan starts with the following set of conditions :

1. We have a clear goal position. A money-less sustainable [Sah2, Wal1] socioeconomic system based on the application of science to society. EOS has a proposed structure based around holons.
2. We have little or no funding. We might have the ability to make small contributions and the more we have the larger our finances become but essentially the plan assume that we have little or no finances.
3. We have a body of people willing to put time and effort into moving from A to B. Each of us has some skill or expertise we can bring to the transition plan.

4. We should not accept loans or other kinds of debts. If we have debts we become slaves to the debt which can distract from the purpose of the plan.
5. We recognise that we can't jump from today's system over night to tomorrow's system.

The plan has a flexible nature so if the starting conditions change we can adapt. Also we have a focus on Europe but can extend beyond that if the opportunity arises (such as Africa of the America).

The Network

EOS proposes a structure for a future society that has its roots in the holon [Wal2] concept and has a distributed nature. This type of structure allows us to add new parts to the system without significantly disturbing the whole structure. The transition plan involves forming a network of holons [Srdoc, EOS2]. Each holon runs itself autonomously but still works towards the overall goal of the network. Individuals form the basic holons and they group together to form communities or companies, which also form examples of holons. Companies and communities can then join together to form larger holons as needed.

The work the communities undertakes takes place in the holons in the form of projects.

We refer to this network as a technate.

Stepping Stone

Each holon takes the form of a Not for Profit Organisation (NPO). The NPO becomes the basic building block. The “Not for Profit” attribute forms the first step away from a money based system. Each NPO still aims to make profit but it does not exist for the purpose of making a profit. That means that each NPO does not distribute profit to its members and has no shareholders.

Working from conditions 2 and 3 above, we propose the formation of simple NPOs, which form the first stepping stone. These NPOs should carry out work that we have the expertise to do and does not cost much, if anything, to set up. These first stepping stones aim to generate some income back into the network or provide a service for the network.

The second stepping stone takes the form of larger companies. The first stepping stones will probably remain at the level of hobby companies; generating some income but hardly enough work or money for employing people although some might transform from a hobby company to one that can employ people. The second set of companies should have enough business to employ people and generate larger income.

As we lay the first and second steeping stone we should also establish a fund to buy land. When we have reached the point that we can secure some income we can start looking at the next steeping stone; communities. These communities should form the homes of the people who work in the NPOs and their families. The communities will work without money internally. That means the people who live in the communities will not get an income for their work in the NPO (or will have a join income for the community). The community, however, will provide food and housing as well as a good standard of living for all the people who live in the community. We aim to start each community with a minimum of 10 – 15 people and to expand to a maximum of 200 people.

At this stage we have started to move even further away from the money based world as we have started forming the money-less interior of the technate.

The next stepping stone involves adding to the network We should add new NPOs as we can and once we have secured finances, add more communities. As each new community or company becomes part of the network the functionality of the network increases. As it does so it has less and less dependency on the outside. The network then becomes one of cooperation [EOS1] where each NPO provides something to the network and in return gets something from the network in a process of reciprocal altruism.

The final stepping stones involve establishing a network that has no dependency to the outside; a true money-less society composed of a network of communities. EOS has a European focus but when we reach this stage we hope that a number of other organisations, world around, would have worked on similar plans. We can then link up with all the other groups and form a cooperative money-less sustainable socioeconomic Type I civilisation (a Terran Confederacy of autonomous communities).

Each step should from a learning opportunity that feeds back into the next steps. So, the network forms an experiment, especially in the early days. Adding NPOs to the network gives us an opportunity to correct mistakes or problems from earlier additions. As we expand we should have a clearer idea of what works and what doesn't.

Problems

This approach has a number of problems. The first lies with getting the people together and to work in the right direction. EOS has only a handful of active members but we have started to implement the plan. We hope that as other groups see what we have done they will either want to join our network as holons or take our ideas and implement them on other parts of the planet. Setting goals and having directors to check goals will help to ensure we all go in the same direction.

Another problem has to do with success. If our companies become successful we might attract too many people who only see the money making opportunity and ignore the purpose and intent of the network. The openness attribute [Sah1] and the role of directors can help towards preventing this but we might also need some legal foundations as well.

Another problem has to do with time. Our current socioeconomic system has already destroyed much of the natural ecosystem and possibly even started to collapse. As a result we might not have time to implement this plan. On the other hand, we might! We will only know through trying.

A Start

EOS has started working on this plan (see http://www.technate.eu). So far we have three organisations in the technate; EOS, Denia and Brain Box. EOS presents the ideology. Denia develops web pages and Brain Box provides server hardware. We can see the cooperation of the network even with these few elements as Denia designs the web site for EOS and Brain Box provides the servers for hosting it.

We now intend to add another company called Nu Ridle. Nu Ridle provides translation services; building on the fact that we have a number of members who can speak a number of languages. After that we intend to start a robotics company selling simple robots over the Internet.

We have also had talks with other groups and we hope that they will also join our network. The more we become; the more power we have to realise a money-less society.

We have plans in motion for forming three communities; one in Sweden called Aurora, one in Slovenia called Solaria and one in Poland called Nexon (we have taken inspiration for the names from Asimov's Foundation / Robots Universe).

Summary

We have very little in the way of resources; we have a handful of people and little finances. Therefore, we have developed a plan to grow a holonic network. Taking what we have today we propose building a network of Not for Profit Organisations that secure finances that will allow us to add communities. As the network grows we become less and less dependent on the money based world. Step by Step we move from A to B.

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The Citizen Card

Introduction

EOS proposes an alternative, moneyless, sustainable, socioeconomic system to our current debt based, money, and unsustainable system. We propose an evolutionary transition from one to the other. We also aim to test out our system as much as possible. So we progress form one system to another based on an application of science that tests the most probable ideas so we know as well as we can what works.

With the above as a basis this article proposes the citizen card as part of the transition from our current system and as part of testing the ideas out first.

Playing a Game

No one has actually lived in a hi-tech, moneyless, socioeconomic system of the type that EOS proposes. Therefore, we lack people with the knowledge and experience of how to live in such a system and how to run such a system. Play offers us one way to over come such a problem as play could encourage creativity [Tim]. We can see play of as a way of gaining experience without "going live"[PN]. We essentially pretend and go through the motions so we have some experience of living in a moneyless society without actually participating in one.

The Citizen Card and Play

The idea of issuing a citizen card forms part of "playing" that we live in a moneyless world. If we actually lived in such a moneyless world that EOS proposes we would live as citizens of a technate. As citizens we would have a citizen card. So, as part of playing we could issue members of the technate, if they wish to join in the game, a citizen card.

The card could help us foster the idea that we live in a technate and help with imagination and creativity as it gives us a physical reminder of the game and could encourage a feeling of association; much like a membership card.

The Citizen Card Specification

A network of holons and holons within holons forms the technate. Each running autonomously. So, we have no central authority; just goals and lines of communications. In keeping with such a model we propose a set of standards that define the basic citizen card but we leave it to the holons to make their own card and have their own design.

Issuing Authority

Essentially anyone can issues a citizen card, so long as it meets the basic requirements. Other holons can then decide if they accept the card or not. In practice we would probably see the role of issuing authority delegated to either specialist holons or as an extended activity of a sub-set of holons. We could also see holons accepting citizen cards that other holons have issued based on a rule such as "we accept whatever holons A accepts" (which means that if any issuing authority can get their card accepted in holon A it becomes accepted in many others holons automatically as well).

Content

Each citizen card identifies a specific individual (so we have a one to one relationship between card and citizen) but each individual can have more than one card (so we have a many to one relationship between person and card(s)). The content defines a citizen card. Each card must meet a basic set of requirements to have the classification of "citizen card" as give below:

- Passport style photo of the citizen
- Full name of the citizen
- Card ID number
- Technate logo
- Issuing authority (name or logo)

- The text “Citizen Card”
- size : 85.60×53.98 mm (ISO/IEC 7810 ID-1 standard)

The Citizen Card example
(NB technate logo and the “Citizen card” text goes on the reverse)

Each issuing authority has the freedom to make their own design and add anything else to they card that they wish.

Tracking

The issuing authority should have a means for tracking and verifying cards that it issues.

Conclusion

The idea of a citizen card should form part of a general “play” with the serious purpose of building experience and testing life in a moneyless socioeconomic system as we move from today’s system.

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Forming a Proto-Technate

The following list the objectives of this document :

1. The develop the design for a proto-technate
2.
3. To develop a research proposal for a proto-technate

The technate logo

The following lists the objective of the Proto- Technate Project

1. To establish an experimental community to test out the ideas of technocracy
2. To form the foundations for a full Technate

Finances

Introduction

The responsibility to raise finances for this project comes under the jurisdiction of the Sequence of Finances of the Network of European Technocrats.

Requirements

The following areas have been identified as requiring finances:

1. The purchase of land
2. The construction of the site / infrastructure
3. The advertising to establish volunteers
4. The initial establishment of a business
5. A reserve finances for maintaining the proto-technate until it has the ability to maintain itself.

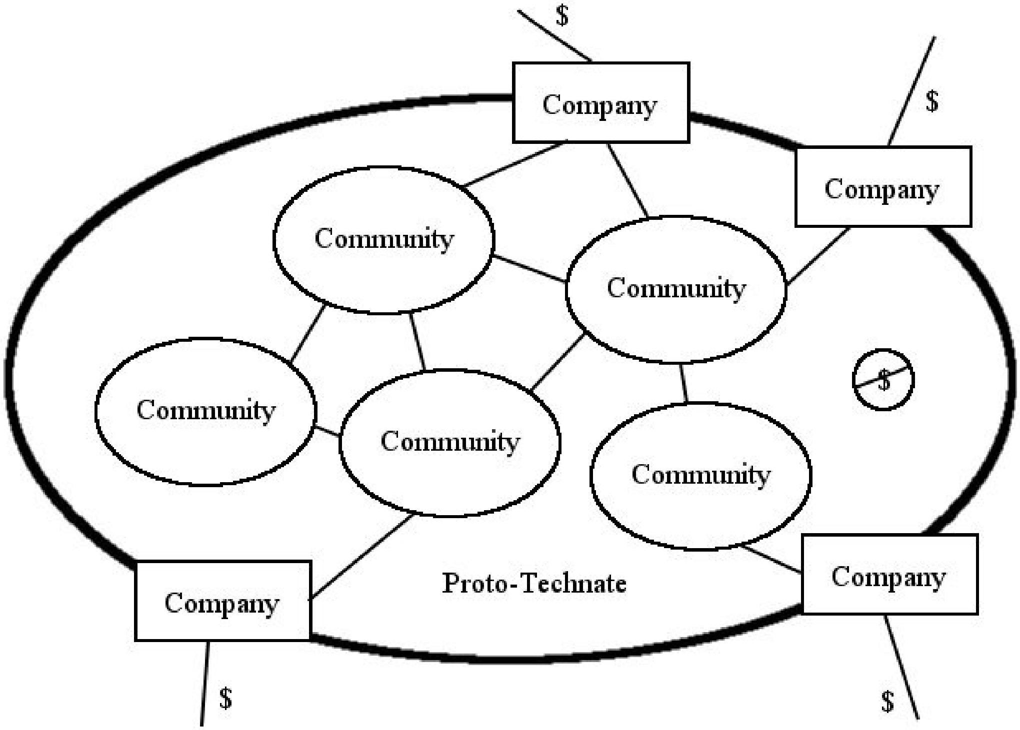

Figure: a Proto-technate

Building a Network

To achieve the objective stated, we propose that EOS should build a network of communities. The communities would have the following properties:

1. Self-sufficient to some degree in terms of energy production, food production, waste management
2. Financial independence, which means the community or NET would own the land and we will not have the possibility to take out loans for this project.
3. Internal technocratic management. Which means people will hold positions within the proto-technate based upon their skills and ability

to do the job. The people living within the proto-technate will use Energy Credits as a means of exchange and regulation.

4. Business front end. Externally, the proto-technate will interact with the rest of the world and gain goods it cannot produce itself through business units, which will have an environmentally friendly attribute. These businesses should have a cooperative nature.

Phases

We propose that this project have a number of phases.

Phase 1

An initial community of approximately 10 adults should form the first phase. The construction of the basic infrastructure of a community would form the objective of this phase. Housing will need construction, food production initiated as well as energy and waste management systems put into operation. Additionally, basic technocratic principles of energy credits and management will need establishing and the foundations for the business front end needs creating.

Phase 2

Once we have constructed the basic system we will need to expand the community to about 200 people representing a realistic selection of the general population. This phase would also involve the establishment of the business front end.

Phase 3

This phase involves expanding from one community to from 3 to 5 communities and forming the basic network.

Community Organisation

The following defines the proposed structure and organisation of a community and the final network for a community (For additional information, please the appendix).

Sequences

The proto-technate would aim to establish the following Sequences but not all at once. The formation of some sequences would take priority over others. For example, we would have more need for Power and Energy and Food Production in the initial phase of the project with sequences such as Research formed in the phase II or III.

1. Health
2. Food production / agro-culture
3. Power and energy
4. Hydrology
5. Architecture
6. Transport
7. Education
8. Administration
9. External relations
10. Research

The sequences lie at the group level for a community but when a number of communities become linked up, zone sequences could also form.[1]

The Group Sequence of Health has the responsibility to prevent and diagnose illness and to care for those who become ill.

The Group Sequence of Power and Energy has the responsibility for the generation and distribution of energy needed in the community. It also has the responsibility to gather data for the Energy Credit system.

The Group Sequence of Hydrology has the responsibility to maintain a fresh water supply and the water features of the community that sequences may use (such as for food production). It also has some responsibility to waste management through the use of water parks.

The Group Sequence of Architecture has the responsibility for the design, construction and maintenance of all the buildings in the community. It also has some responsibility for waste management.

The Group Sequence of Transport has the responsibility of maintaining vehicles needed within the community and for transport outside the community.

The Group Sequence of Education has the responsibility for educating the members for the community and providing child care if needed.

The Group Sequence of Administration has the responsibility for maintaining the energy credit system and additional administrative functions.

The Group Sequence of External Relations has the responsibility of handling all external affairs of the proto-technate, which includes the external business relationships.

The Group Sequence of Research conducts scientific research in any field that the community can support. Science and education form central activities for a proto-technate. However, in the early stages research we would aim research more at activities that help to sustain the community and at automation. As the proto-technate expands, we would extend the areas of research.

Appointments to positions within the community

The skill of a person forms the only criteria used for appointing a person to a position. As far as possible a person becomes appointed through their peers appointing them, taking into account the person’s experience and qualifications.

Each Group Sequence will have a director and a deputy-director. Skills of interest include a technical knowledge of the area of the sequence, team management skills and a knowledge of technocracy as well as general education level.

People can make a request for the removal of a person from a position if they can show that the person has not fulfilled their duties on a technical level only. Only the person’s peers can make a decision to remove a person.

People can have the following appointments

- Group-Director of a Sequence
- Deputy-Group Director of a Sequence
- Project Manager

- Task expert

The Group-Director of a Sequence has the overall responsibility to ensure projects run according to the goals of technocracy and for providing communications paths between projects and Sequences.

The Deputy-Group Director of a Sequence aids the Group-Director as needs dictate.

The Project Manager has responsibility for a project

The Task Expert has responsibility for a given task.

For the proto-technate as a whole the board of directors of NET also form the Board of directors for the proto-technate.

As the proto-technate expands the proto-technate may also need the additional positions of Zone-Director and Deputy Zone Director (and even higher if it expands beyond the 3-5 communities).

Projects

The proto-technate would organise work conducted within a proto-technate along project lines. Projects would have the following classifications:

1. On going
2. Temporary

On-going projects would include those task that have not termination point which might include the administration of the proto-technate.

Temporary projects have a termination point and could include projects to repair part of the building or research an new are of science. Temporary projects may also terminate and then restart. For example, a project to harvest a certain crop may terminate when people have completed the harvest but the project may restart next year when the crop needs harvesting again.

Starting a project

No project can start without the approval of the appropriate director and each project should have a goal and a team associated with it. Anyone can propose a project to the appropriate sequence director or the director can initiate a project. The project should have a set of one or more goals. For a project to start it must demonstrate the following:

1. Its goals have a compatibility with the long term of technocracy
2. The proto-technate has the necessary resources, which includes personal, to undertake the project.

If it can demonstrate the above then the director can authorise the start of the project. The project then runs autonomously with no further interference from anyone outside the project so long as its activities remain compatible with the overall holistic goal and it does not exceed its resources.

If a project deviates from its original goals or consumes more resources than was initially indicated the appropriate direct can either cancel the project or re-approve it.

Project Managers

Each project should appoint a project manager. The team members appoint the manager based on skills from a set of possible managers who wish to take the manager role. The manager has the responsibility of organising the project and the resource needs for the project. The manager also has the responsibility of ensuring that the project maintains its direction and achieves its goals as best as possible.

Energy Production

The proto-technate should aim to produce its own energy in a sustainable way. Methods available include:

- Wind
- Water
- Bio
- Solar
- Geothermal
- Diesel electric

Of these probably wind and solar represent the best options with diesel electric offering a good short term possibility both in terms of energy production and cost to install.
In addition, the proto-technate should aim to minimise its energy consumption in the way it designs housing, for example, to minimise heating requirements and lighting needs (though installing low energy lighting).

The proto-technate may also gain so advantage in producing extra energy and selling, if possible.

Food Production

Methods:
Greenhouses, permaculture and hydroponics with chickens, fish and possibly other animals. Should aim to have a cyclic supply of nutrients such as fish supplying nutrients to the hydroponics.

Suggestions for food:

- Peanuts, Brazil nuts, almonds, hazels, walnuts, pine kernels.
- Sesame, pumpkin, sunflower, linseeds.
- Eggs
- Apples, strawberries, blueberries, cherries, plums, raspberries, melons
- Peas, beans, lentils.
- Wheat, barley, oats, rye, millet, rice.
- Soya and soya products
- Brussels sprouts, carrots, cabbage, lettuce, swede, turnip, kale

- Milk, cheese, butter, cream, yoghurt.

Community Housing

Modular, circular construction based on geodesic domes (see "alternative urbinate design" on page 112). Should have family homes, single person accommodation and common areas + conference / meeting areas and guest accommodation.

Education

Education forms an important part of the proto-technate. Everyone should have the opportunity to learn, develop and advance and the education system should offer facilities for anyone to learn whatever they wish and to learn at their own rate.

The community should aim to establish its own education facilities as much as it can. Concentrating on the youngest children at first and then, as the proto-technate expands, older children and adult education, for practical reason (i.e. due to the limited nature of resources in the early days of a proto-technate).

The education system should use the best practices known to encourage critical thinking, logic, mathematics and an understanding of science and art. It should also aim to teach skills necessary for the proto-technate and to teach people how to learn so they can learn for themselves. The education should also have a high degree of practical application. The proto-technate should aim to establish facilities such a laboratories for learning as well as using what resources the proto-technate might have available such as wood to teach biology.
The education system should use projects and assignments as a preferred means demonstrating a person's learning and abilities.
The system should have a structure and have goals to achieve but each individual should have the freedom to advance at their own rate.

The education system should aim to teach morality and cooperation at an early age.

References

1. Andrew Wallace. Technocracy: Building a Sustainable Society for a Post Carbon World. 2007. ISBN 978-1-4475-5345-8.

By-Laws

ARTICLE I. Definitions, Characteristics and Purpose.

Definition – Proto-technate :

1. A community and network of Not for Profit Organisations and communities that aim to test out, as much as practically possible, technocratic principles
2. A foundation of a full Technate

Characteristics:

1. Internally operates according to technocratic principles. a. Internal use of energy credits b. Rule and administration based on skill c. No ownership of property beyond small personal possessions
2. Externally cooperates as a cooperative enterprise a. Finances raised but such activities become part of the proto-technate. b. Embedded within our current socioeconomic system
3. Peaceful, cooperative (non-competitive) society that strives to eliminate racism, sexism and to treat people as having equal value.
4. Non-religious. The proto-technate has no foundation in religion, spirituality or other forms of myths and shall maintain a religious natural environment.

   a. Members shall keep religion personal. Members of a proto-technate may engage in religion, spirituality of beliefs in other myths privately but the proto-technate does not permit external religious displays. Purpose:

The proto-technate has the following purposes

1. Experimenting with technocracy on a social scale and of laying the foundations of a full Technate.
2. To build a society based on technocratic principles rooted in science.
3. To serve as an example and demonstration of the implementation of technocracy

Article II. Membership.

Definition – member

Someone who has joined the proto-technate as full participates in running and operation of the proto-technate. A member may remain a member for up to 10 years before becoming a citizen. A member may own and operate external operations that they were engaged in before they became a member.

Definition – citizen

Someone who has become a full member as has transfer all external property to the proto-technate.

The proto-technate has different "member" and "citizen" categories for the purpose of protecting people in the event that the proto-technate experiment fails. As the proto-technate has common ownership of property (beyond small personal property) any business activity of property that members used would belong to the proto-technate. Members can keep external property that they held before joining so they don't lose everything if the experiment and community was to dissolve.

Membership agreement

The proto-technate will maintain and display a membership agreement, which each member will sign and agree to. The proto-technate can change the agreement with a consensus and each member should acknowledge the changes.

The term member refers to both members and citizens in this agreement.

Upon joining the community a person remains a provisional member for six months. After the six months has passed the automatically become full members and then citizens after 10 years, if no objections were raised.

The directors may offer membership to anyone suitable for the proto-technate, subject to available space and the physical ability of the proto-technate to sustain the addition of members.

Once a person has held provisional membership for six months and becomes a full member that person can hold membership for life, unless terminated.

A member can voluntary terminate the agreement or the proto-technate can terminate the agreement. If either side terminates the agreement the member cannot claim back any property donated to the proto-technate or any earnings acquired during the members time in the proto-technate. The member will have no right, claim or interest in any property of the proto-technate for any work or service conducted during their time in the proto-technate.

A member can voluntary terminate membership whenever they wish. If a member voluntary terminates their membership they have 3 months to change their minds. The proto-technate can only terminate a person's membership for the following reasons:

1. The directors have determined that the person's behaviour as excessively violent or abusive and has caused harm or suffering to other members.
2. The person does not carry out their fair share of work within the proto-technate.
3. The person have left the proto-technate with no indication of return for more than 3 weeks.
4. The person actively works against the proto-technate and against the ideas of technocracy and, thus does not contribute to the proto-technate or goals of technocracy.

The directors, at either level of the proto-technate, only may termination of a person's membership subject to the following procedures.

1. One or more people may place a request for the termination of another person to an appropriate sequence director.
2. That director then has the responsibility to conduct an attempt to correct the person's behaviour.
3. Failing that, the director should give a private warning of the likelihood of termination.
4. If the member's behaviour does not improve, the director should discuss the matter with the other directors.
5. If the directors have no other cause of action to rectify the situation that may issue a public warning to the member.
6. If behaviour does not change then they directors may terminate the person's membership.

The directors have discretion as to the time between each step, however, they must give adequate time for the member to correct their behaviour. If the director takes no further action within a year, the case becomes closed.

ARTICLE III. Governance.

The governance of the proto-technate shall have a technocratic nature. All positions of director, deputy director and project manager help to facilitate the smooth running of the proto-technate. They do not carry any special privileges for the office holders.

The board of directors

The community shall have a board of directors that the members elect. Each director will have an appointment appropriate to their skill, expertise and qualification. Skill only shall form the criteria for election to the board. For a candidate to stand for election that must first show they have the relevant skills, qualification, experience and expertise for the position.

The board of directors comes under the board of directors of the proto-technate and operate initially at the group level at the group level. As the proto-technate expands the from one to more communities, each community will have a board of directors at group level and the proto-technate will have a board of directors at zone level.

1. The directors have the following responsibilities:
2. To insure that the running of the community follows technocratic principles
3. To insure the legal integrity of the proto-technate in whatever country forms the location of the proto-technate or its member communities.
4. To approve or disapprove the start of a project
5. To terminate a project that no longer contributes to technocracy or presents a danger to the proto-technate.
6. To terminate members if the need arises.
7. To initiate proto-technate wide projects
8. To enable and ensure communications between projects and sequences in the proto-technate.

Project managers

Each project that the proto-technate runs shall have a project manager appointed who hold responsibility for that project.

The directors can appoint a project manager at the start of a project or a project team can appoint a project manager. Only a person with the relevant technical and managerial skills can hold a project manager appointment.

Only the team members of a project can dismiss a project manager though voting at a specially called for project meeting. Removal of a project manager can only take place on the grounds of technical skill.

An appointment to project manager lasts for the duration of the project or, in the case of a on-going project, for a fix durational greed to at the start of the appointment.

A project manager acts independently. A director or deputy director has no say in the way a project manager mages a project.

ARTICLE IV. The Property Code.

The proto-technate shall use Energy Credits internally as a means of ensuring equal access to the resources of a technate. Property shall have the classification of either petty or grand.

Petty personal property includes all personal property that a person can carry, wear or take into their home. This includes, but not necessarily limited to, furniture, bedding, small tools and appliances, clothing, jewellery, watches, books, records, CD, tapes and such like, and bicycles. These items remain the personal property of each member and each member has the right to utilise these items as they wish.

All members have an obligation to respect the ownership and exclusive use of petty private property.

Grand property includes all property that a person cannot take into their home. Such property includes cars, truck, and other vehicles, houses, or other land, power tools, and other machinery. A person may not bring such property into the proto-technate without the agreement of the board of directors. Such property remains the property of the owner until such time as the person has remained with the proto-technate for a period of 10 years. At which time the ownership transfers to the proto-technate. All such property remains the exclusive use of the owner until the owner accepts full membership. At which point the proto-technate may responsibly use the property as needed. The proto-technate will undertake people will use the property with care but the proto-technate does not accept any responsibility for damage or wear and tare of the property.

A member shall loan any capital investment to the proto-technate for the duration of their membership.

ARTICLE V. Dissolution of the Community.

The board of directors may dissolve the proto-technate subject to 66% or great vote of the full membership for the dissolving. The directors shall take the vote at a special meeting which they will announced to all full members with a minimum of 10 but no more than 50 days' notice before the meeting. If the proto-technate dissolves the directors, or suitably appointed persons, shall liquidate all assets and first pay all debts that the proto-technate may have. The directors, or suitably appointed persons, shall divide equally any additional remaining finances between all full members of the proto-technate.

ARTICLE VI. Amendment of the Bylaws.

Only the board of directors of the proto-technate or of EOS can amend these by-laws subject to the agreement of 66% of the full membership of the proto-technate. With the following exceptions:

1. Science forms the central basis for the proto-technate. All amendments need to have a rational basis for their change.
2. The rule of the skill. All positions appointed within the proto-technate must have a basis in skill.
3. No amendment shall in away support racism, sexism or other forms of discrimination or in any way prevent a person from achieving their full potential.

Appendix - A List of Suggested Community Names

Suggested Names for Communities / Urbanates within the Technate

The following forms a ***suggestion*** for names for communities and later urbanates formed within the technate.

Societies and civilisations often take inspiration from history of mythology for names. Our current civilisation takes inspiration from the Jewish / Christian mythology as well as some Greek, Germanic and other sources for names. A technate, however, has its roots in science and engineering. Therefore, I suggest we look to other sources for communities name than the traditional sources of our current society. We could see science fiction as a "mythology" for a science based civilisation, therefore, we could use names inspired from science fiction.

Foundation

The inspiration for the following comes from Asimov’s "Foundation" series.

- 1 Alpha
- 2 Anacreon
- 3 Arcturus
- 4 Askone
- 5 Asperta
- 6 Aurora - allocated for a community in Sweden
- 7 Baronn
- 8 Bonde
- 9 Cil
- 10 Cinna
- 11 Comporellon
- 12 Cygni
- 13 Daribow
- 14 Derowd
- 15 Epsilon
- 16 Erythro
- 17 Euterpe
- 18 Florina
- 19 Fomalhaut
- 20 Gaia
- 21 Gamma Andromeda
- 22 Getorin
- 23 Glyptal
- 24 Haven
- 25 Helicon
- 26 Hesperos
- 27 Horleggor
- 28 Ifni
- 29 Iss
- 30 Jennisek
- 31 Kalgan
- 32 Konom
- 33 Korell
- 34 Livia
- 35 Locris
- 36 Lyonesse
- 37 Lystena
- 38 Mandress
- 39 Melpomenia
- 40 Mnemon
- 41 Mores
- 42 Nebula
- 43 Neotrantor
- 44 Nexon - allocated for a community in Poland
- 45 Nishaya
- 46 Ophiuchus
- 47 Orsha
- 48 Rhampora
- 49 Rhea
- 50 Rigel
- 51 Rossem
- 52 Salinn
- 53 Santanni
- 54 Sarip
- 55 Sark
- 56 Sayshell
- 57 Sirius
- 58 Siwenna
- 59 Smitheus
- 60 Smushyk
- 61 Smyrno
- 62 Solaria - allocated for a community in Slovenia
- 63 Synnax
- 64 Tazenda
- 65 Terel

- 66 Terminus
- 67 Trantor
- 68 Vega
- 69 Vincetori
- 70 Voreg
- 71 Wanda
- 72 Wencory
- 73 Zoranel

Blake's 7

- Agrava
- Albion
- Altern
- Aristo
- Atlay
- Auron
- Beta
- Betafarl
- Bucol
- Caspar
- Centero
- Cephlon
- Chenga
- Crandor
- Cygnus Alpha
- Del
- Destiny
- Domo
- Exbar
- Fosforon
- Gauda Prime
- Goth
- Helotrix
- Horizon
- Kairos
- Keezam
- Lindor
- Malodar
- Mecron
- Obsidian
- Pharos
- Porphyrus
- Saurian Major
- Sardos
- Sarran
- Teal
- Vandor
- Virn
- Xaranor
- Xenon
- Zerok
- Zonda
- Zondawl

Star Wars

- Alderaan
- Bespin
- Boz Pity
- Cato Neimoidia
- Coruscant
- Dagobah
- Dantooine
- Endor
- Felucia
- Geonosis
- Hoth
- Kamino

- Kashyyyk
- Kessel
- Malastare
- Mustafar
- Mygeeto
- Naboo
- Ord Mantel
- Polis Massa
- Saleucami
- Tatooine
- Utapau
- Yavin

Appendix - Formal definitions

Technate (2-20100426-120332)

1-20100426-114637
1-20100426-113055 1-20100426-114329 1-20100426-113554 1-20100426-115007
1-20100426-115522 1-20100426-120132 1-20100426-115748

Requires:

Goal (1-20100426-114637)

The technate aims to maintain the highest standard of living possible for the longest time possible. This means the technate commits itself to a sustainable hi-tech society that balances the needs of the people with those of the environment

Technate (1-20100426-113055)

The term technate refers to an operational area where experts manage the technology.

Expert management (1-20100426-114329)

As many complex parts form the composition of a hi-tech society it takes a hi-level of education to understand just a part of it. Therefore, the people with the knowledge skill and expertise within a given area should make decisions within that area.

Expert (1-20100426-113554)

The term expert refers to a person who has attained a skill and ability in a given area. A person's peer group recognises the person as an expert through the person demonstrating proficiency in the area of expertise to the satisfaction of the person's peer group. Accepted as an expert in a given field the person authorises a person to make competent decisions in the domain of expertise.

Distribution of power (1-20100426-115007)
Experts manage the technological aspects of society within their domain. As no one has expertise in every domain this leads to a distributed form of management.

openness (1-20100426-115522)
Experts in one domain should have access to work that other experts in the same domain have done for the purpose of peer review. Experts may criticise the work of other experts in the same domain. Valid criticism comes from other experts.

science (1-20100426-120132)
The term science refers to both a method and a body of knowledge gain from applying that method. We assume that we can test nature and nature plays fair. We can use experimentation, observation, logic and Occam's razor to gain knowledge about the nature.

appliance of science (1-20100426-115748)
The application of scientific method and sound engineering principles form the only method for retrieving knowledge and developing the technological aspects of society.

Membership

EOS proto-technate class (2-20081014-083909) 1-20081014-082428

1-20081014-082730 1-20081012-172941 1-20081012-173023 1-20081012-173146 1-20081014-083146 1-20081012-173226 1-20081012-173254 2-20081009-015345 1-20081009-015623 1-20081012-231937 1-20081014-081651 1-20081014-081847 1-20081014-082102 1-20081014-083726 1-20081014-083417 2-20081011-235208 2-20081011-235457

Requires:

Principle of the EOS proto-technate (1-20081014-082428)

A proto-technate is a stepping stone towards a sustainable hi-tech society and
an experiment in technocracy. It is composed of communities and NPOs structured in a holoarcy. The proto-technate works with EOS

Principle of EOS proto-technate membership. (1-20081014-082730)

Any person can become a member of or work for a community of NPO that forms part of the NET proto-technate without becoming a member of EOS. So long as the person accepts the principles for the proto-technate and does not attempt to disrupt the running of the NET work or its organisation.

Principle of technocracy (1-20081012-172941)

placing people in technical positions based on skill and ability.

Principle of directors (1-20081012-173023) accepting the director's authority to approve goals.

Principle of cooperation (1-20081012-173146)

accepting the coordinators authority to establish coordination with other groups.

Principle of non-interference of the technical management. (1-20081014-083146)

Accepting the decisions of a appointed technical expert with the domain of the expert and of not interfering with domain outside ones own area of expertise.

Principle of project leadership (1-20081012-173226)

accepting the project leader's authority to manage projects autonomously.

Principle of Energy Accounting (1-20081012-173254)

accepting energy accounting as a means to allocate resources within a (proto-)technate.

Class of diversity and equality (2-20081009-015345)

1-20081009-015623, 1-20081009-013243

Requires:

Principle of diversity (1-20081009-015623)

People and / or organization should be able to use the full range of aptitude and perspectives of our diverse members to ensure that we have the breadth
of viewpoints, experiences, and intellectual skills needed to succeed.

Principle of diversity (1-20081009-015623)

People and / or organization should be able to use the full range of aptitude and perspectives of our diverse members to ensure that we have the breadth of viewpoints, experiences, and intellectual skills needed to succeed.

Principle of no religious affiliation (1-20081012-231937)

People and / or organizations should be non-religious

Principle of holonic organisation (1-20081014-081651)

Accepting the basic holonic organisation structure proposed by EOS and accepting the formation of groups, areas, zones and sectors as needed.

Principle of not-for profit (1-20081014-081847)

Agree to that the organisation should not work for profit.

Principle of sustainability (1-20081014-082102)

The organisation will work in an eco-friendly way and attempt as far as possible to work in a sustainable way.

Principle of appointment and removal within a proto-technate (1-20081014-083726)

Accepting the appointment of a person to a position by the persons peers based on the persons technical skills only. Accepting the removal of a person form a position for technical reasons only.

Principle of openness and peer review. (1-20081014-083417)

Allowing open access to all work, reports and other documents for a given project / group or other organisational structure within a proto-technate. Accepting peer review of work conducted within the proto-technate.

EOS approved proper principles and classes handling Class (2-20081011-235208)

1-20081009-224823 Principle of usable principle definitions
1-20081009-224423 Principle of principle and class ID assignment
1-20081011-234433 Principle of correct principle evaluation
1-20081011-234625 Principle of freedom to make Principles and / or Classes 1-20081011-234655 Principle of principle non-modification
1-20081011-234733 Principle of storing Principles and Classes
1-20081011-234814 Principle of free access to Principles and Classes

Requires:

Principle of usable principle definitions (1-20081009-224823)

People and / or organizations defining new principles or classes should write
the definitions in such a way that whether or not a person and / or organization adheres to it or not, is clear from the definition.

Principle of principle and class ID assignment (1-20081009-224423)

People and / or organizations that define new principles or classes have to assign each an ID. The ID should be in the format X-YYYYMMDD-HHMMSS, where X is 1 if it's a Principle, or 2 if it's a Class and the YYYYDDMM and HHMMSS are the time at which the principle / class was written or finished.

Principle of correct principle evaluation (1-20081011-234433)

The person or organization judging if people or organizations meet a principle
or class, should use the definition of that principle or class, to determine if the
current state and activity of the person or organization in question follows the
definition or not. The comparison between the actual state and the principle
or class definition should be the only and most important criteria for determining this. If the definition is not specific enough to do this objectively,
subjective judgement may be used.

Principle of freedom to make Principles and / or Classes (1-20081011-234625)

EOS approved proper principles and classes handling Class (2-20081011-235457)

1-20081009-224823, 1-20081009-224423, 1-20081011-234433, 1-20081011-234625, 1-20081011-234655, 1-20081011-234733, 1-20081011-234814

Requires:

Principle of usable principle definitions (1-20081009-224823)

People and / or organizations defining new principles or classes should write
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Principle of freedom to make Principles and / or Classes (1-20081011-234625)

Any person must be allowed to define new Principles and / or Classes.
No person or organization may prevent any person from defining a new Principle and / or Class.

Appendix - The EOS Constitution

Overview

The European Organisation for Sustainability (EOS), formed in 2005 (as the Network of European Technocrats (N.E.T.)) and registered in Sweden in 2006, is an autonomous research and social movement that aims to explore and develop both the theory and design of technocracy. Technocracy is an alternative and unconventional social theory derived from the physical sciences that places an emphasis on the role of energy as an organizing element in society. Given that the original theory and design of technocracy focused largely on North America alone in the early twentieth century, EOS aims to adapt and develop said theory and design into both a European and global context. Therefore EOS is an organization developing theory that shares commonalities with original technocracy but is largely a separate wing of technocracy. EOS was registered as an organisation in Sweden in 2006, organisation number 802431-9330.

Mission

The mission of EOS is to achieve the aforementioned vision with reference to:

1. To investigate unconventional socio-economic and political paradigms, employing scientific methodology as the prime tool.
2. To allow a community for the critical examination and development of the underlying philosophy of present potentially new social, economic and political paradigms.
3. To perform the aforementioned in light of the contemporary challenges of energy availability, climate change, ageing population, health and economic disparity.
4. To elucidate means of socially, economically and technically implementing sustainable reforms in a practical and realistic manner.

The European Model

As with technocratic theory, the design has separated into both the North American and European schools of thought, however as before common ground may be found amongst the principles that both schools of thought share as beginning points. Central to the design of both North American and European technocratic schools is the call for fundamental structural changes to the existing political and economic makeup of industrial society, that the social realm may accurately reflect the physical basis upon which it is built. Presently the North American model is the only in existence that can be said to be complete; however the following lists the beginning points of a European model which is still under development. It should be noted that the North American model has been used as a beginning point itself, the influence of which is indicated below:

Crucial concepts

Comparison with the US version

1. Influence of technology [American] and social change [European]
The key observation of the technocratic doctrine is the role of high energy technology in forging the material wealth of industrial societies. As a theoretical foundation, the North Americans sought to use this influence to create a model of society in which the human adapted to physical changes in society. The European model proposes that social change occur concurrently as a dynamic element of technological change instead of a response.

2. Absolute abundance [American] becomes Relative abundance [European]
The original technocrats proposed that an abundance of material resources, technology and trained personnel existed in the industrial society of North America during the 1930's derived from the observation that there existed the capacity to produce more goods than could be consumed by the population, and that the abundance of energy resources such as oil, coal and gas was the prime driving force

behind this apparent abundance. The European model recognizes the need to incorporate not only the availability and quantity of resources but also the dynamic equilibrium that exists between resources, population and the renewal of resources for continued use. Thus 'relative abundance' is utilized as a term to indicate the relative balance of resources to that which can be effectively produced, consumed and returned to the production cycle.

3. Energy accounting [American] and alternative methods of distribution [European]
Proposed as an alternative to money and a means to track the consumption of goods and services, energy accounting characterizes one of the central distributive approaches to economics that the early technocrats made. The European model has begun to recognize the role of exchange and distribution in shaping human motivational behaviours.

4. Dynamic equilibrium and sustainable development [European]
A new addition to technocratic analyses is the inclusion of ecological and climate concerns into the physical analysis of the social realm. Key among these analyses is the recognition that issues of energy availability, climate change and ecology represent a unified issue in terms of the flow of resources from the earth to industrial society, and eventually back to the environment. This element of the European model recognizes the requirement to reduce the dependence on non-renewable and cost-externalized resources in order for the social realm to continue to develop.

5. Consumerist paradise [American] in light of ecological footprints and enlightened immaterialism [European]
The original North American model proposed that individuals would be given the greatest freedoms to both behave and consume as they pleased. The European model emphasises that the original model based this assumption on the availability of mainly fossil fuels, the mass use of in the present day would be not only foolish but highly untenable due to the increasing scarcity of said fuels and the impact

these fuels have on climate and ecology. Tied into the notion of concurrent social change with technological change, it is proposed that a general change in philosophy and ideas about consumption is required in order to bring about positive social change.

6. Functional use of available resources [American] and feedback of resources to maximize their functional utility [European]
Central to both the philosophy and design of the North American technate was the efficient use of resources to maximize the abundance of goods and services. As a development of this, the European model seeks to do this with not only the functional use of available resources, but the feedback of these resources in closed infrastructural loops in order to maximize the absolute functional utility of all resources.

7. Meritocracy [American] and Democracy [European]
Perhaps the most well-known of technocratic theses is the proposal that scientists and engineers manage society in a role akin to that of politicians. The European model proposes that although a meritocratic distribution of experts to manage economic matters on a physical or thermodynamic basis is necessary in such a design, there exists areas of society to which individuals must have the power to influence, lest they become unregulated agents of tyranny. These areas focus on the social arena and largely involve collective decisions that relate to the values and ideas of said collective groups, including access to a democratic and impartial judicial system.

8. Centralized [American] becomes decentralized [European]
Extending from the meritocratic structure of decision making, the North American model proposed that the operation of an entire technate would occur on the basis of a hierarchy of engineers and scientists covering an entire continental area. Developments in the European model have focused on de-centralizing this hierarchy into smaller co-operative units distributed over large geographical regions. The rationale behind this approach is to maximize the autonomy of smaller communities while maintaining the

interdependence necessary for the large scale operation of a technological mechanism.

9. Hierarchical [American] and co-operative [European]
The distribution of power and authority in the original design was largely pyramidal, extending to a tip at the head of the technate where decisions would be made upon all aspects of society, using impersonal scientific methods. The European model recognizes the need to diffuse power and authority horizontally in order to encourage co-operation, and lateralize responsibility.

10. Provincialism [American] and internationalism [European]
The original model called for the establishment of a Technate over a limited geographical area, notably a continent. Also limited in this model was the extent to which the technate interacted with its neighbours and other states/technates. The European model teeters between such provincialism and a more international approach.

Appendix - An Auxiliary Language for a Technate

We aim for a system that not only respect people's differences but sees differences as an important contribution to human development. In such a system we expect to see multiple cultures and languages within the limits of tolerance and human rights. However, necessity would dictate a common language for the technical administration of a technate.

At the moment, in the early 21st century, this would default to English. However, commonality does not necessary making a language such as English are suitable language for technical and administration. In common with all natural languages and some artificial languages such as Esperanto, English has some inconsistencies in spelling and construction and ambiguities.

Therefore, we propose an auxiliary language for technical administration of the technate. This would form a common language for the technical side of a technate but we do not aim for such a language to replace any natural language within the technate.

The "language of science" does, in a way, form language yet it does not have the full construct of a real language. We do, however, have an artificial language that has on the construct of mathematics, the foundation of the language of science, but in a form of a real language; Loglan [Log1, Log3].

Introduction

The name **Loglan**, in this context, refers to the logical language that James Cooke Brown first started to develop in the 1950s. Loglan forms an example of a *logical language* because the developers based the language on predicate logic which forms a way of defining logical relationships. However, for practical purposes you could view the language as an example of a *fill the blanks* language as each of the main type of words used in Loglan effectively form an incomplete sentence where you fill in the blanks to complete the meaning. For example, the Loglan word meaning *to see*, *vizka*, has three blanks and forms the sentence *x sees y against background z* as in *mi vizka tu* meaning *I see you* (you don't have to use all the blanks in Loglan).

Loglan has a number of advantages over natural languages and languages such as Esperanto.

Loglan has a set of consistent rules - no exceptions

Consistent spelling (the base words come in either CVCCV or CCVCV form (where C stands for "consonant" and V for "vowel")).

- Simpler rule set. Loglan has about 200 rules, far less than a natural language.

- A defined way to grow so any additions follow a set of rules as the language grows and develops. So, once you know Loglan your knowledge doesn't get out dated as the language changes.

- Simpler grammar. No nouns, adverbs, imperfect forms etc to learn.

- A logical language there has a different construct compared to natural languages and thus requires a bit of a different way of thinking when you construct a sentence.

This chapter presents a brief overview of Loglan. Loglan has the following building blocks for constructed sentences

- Predicates. These form incomplete sentences to which you are arguments to complete the sentence and say what you want
- Arguments. These form the afters and objects which you would like to talk about.
- Little words. These are controlled words that adds extra meaning and clarification to sentences.

An overview of Loglan

Predicates

You use predicates to form the main subject of a sentence. If fact, you can view a predicate words as an incomplete sentence. Just fill in the blanks to say what you want to say. Each predicate word has from one to five blanks to fill in.

Predicates come in three main forms.

Base words
Compound words
Lone words

Base Words

These form the main set of words used in Loglan. They have a constant spelling; either CVCCV form or CCVCV form. They all end in a vowel and they all have only one meaning each.

Examples

NB. The letters x, y and z represent the blanks.

CVCCV form
vizka - x sees y against background z
hasfa - x is the house of y
tarci - x is a star of galaxy y
fundi - x likes y more than z
takna - x talks to y about z

CCVCV form
cnida - x needs y for z
clika - x is similar to x in feature z
tcaro - x is a motorised vehicle

jmite - x meets y
zvoto - x is outside of y

Compound Words

The base words in Loglan number about 1 500. To say more you can use two or more base words to make a metaphor. If you think others can use the metaphor you can combine the words to make a new word. Each base word has a combining form which you can use to construct more complex words.

Examples

fagctu - ash. Constructed from *fagro* (fire) and *ctuda* (excrement); fagro ctuda. The word *fagro* has the combining form *fag* and *ctuda* the combining form of *ctu* so the metaphor *fagro ctuda* becomes the word *fagctu*.

bamfoa - sphere. Constructed from *balma* (ball) and *forma* (form / shape); balma forma. The word *balma* has the combining form *bam* and *forma* the combining form of *foa* so the metaphor *balma forma* becomes the word *bamfoa*.

trigru - forest / wood. Constructed from *tricu* (tree) and *grupa* (group); tricu grupa. The word *tricu* has the combining form *tri* and *grupa* the combining form of *gru* so the metaphor *tricu grupa* becomes the word *trigru*.

Lone Words

When using Loglan you try to use Loglan word to construct a metaphor for a new idea of concept. However, you might not have the opportunity to do that at all time such as when an idea or concept has a close relationship to one group of people. In such cases, Loglan allows borrowing but with certain rules.

Examples

proteini - x is a protein of type y
cerkopithekui - x is a cercopithecus (a primate) of that genus

Arguments

These form a set of words that you use to fill in the blanks of the predicates. They form the objects or agents that you talk about. Arguments come in three forms:

- Names
- Predicates as arguments
- Little words as arguments

We use a little word to tell the difference between a name and a normal predicate word used as an argument; either *le* or *la*. The little word *le* means *the one I call* and the the little word *la* means *the one that actually is*. The word 'le' then forms a prefix for a description and the little word *la* forms a prefix for a name.

Names

Names in Loglan come in two types:

- Proper Names
- Predicate Names

All proper names end in a consonant and can have any number of letters. We can use predicates as names if we use the little word *la* first. As predicates together form a metaphor we use the little word *gu* to show where the name ends and the main predicate of the sentence starts.

Examples

Proper names:

Frans - France

Sol - Sun

Romas - Rome

Predicate Names

la farfu - father / dad
la ratcu - Rat

Predicates as arguments

You can use predicates words as arguments to the main predicate of a sentence to form the object or agent of a predicate. To do so, you need to add the little word *le* to show that the you mean *the one I call* and then use the little word *gu* to show when the argument predicate comes to an end and the main sentence predicate begins.

Examples

le nirli gu tcatro - the girl is driving (a vehicle)
le farfu gu kamla - the father comes
le hasfa gu redro - the house is red
le prano mrenu gu goztsefui - the running man is late

Little words as arguments

Loglan has a number of little words that you can use for common occurring actors or objects.

Examples

tu - you
ti - this
toi - that (the last mentioned remark)
da - he / she / it

Little words

Little words form a type of control word for sentences. You can use them to *form brackets*, add time and place or add additional information to a sentence. You can also use some little words for common words you might use such as *me*, *it* or numbers.

Examples

mi - me / I / myself
gu - a separator between predicates / a right boundary marker

to - the number two
rau - ... because of reason ...
e - and

Some Example Text

la mi komta gu siorbodcea uu nukou le fu nakso je kei jue mi. i mi sromao le komta numlea ice genza durzo lepo mi pogsea le kompta troli dursio.

References

[Log1] James Cooke Brown. "Loglan 1". http://www.loglan.org/Loglan1/

[Log3] Steve Rice. "Loglan 3". http://www.loglan.org/Loglan3Download.html.

Appendix - Human Nature

The scientific research over the last few decades tends to support the idea that human begins do have a nature that has a genetic origin but also the environment does influence our behaviour thus human behaviour results from both nature and nurture through the complex interaction of them both. Human nature includes some positive behaviour patterns; humans have a curious nature and cooperate to help each other for example. It also has some less desirable attributes such as the use of violence. The design present here does not aim to alter human nature but instead aims to work within the bounds human nature and through environment design encourage some behaviour patterns and discourage others.

An Overview of Some Aspects of Human Nature

Behaviours

Environment [1][2]

Africa :

- hunter gathers
- small groups (max 200)
- open grassland / woodlands / water
- animals

Genes [1][2][3]

- Actions to ensure survival of genes (selfish genes).

Reproductive behaviour[1][2]

Strategies[1][2]

- r - hi reproductive rate, short generation time, little offspring investment
- K - lo reproductive rate, long generation time, hi offspring investment
- Humans use K strategies

Rape[1][2]

- Hi value females more likely to get raped

- Lo value males more likely to rape

Parenting[1][2]

- Invest more time into own offspring
- males less likely to invest time in children (less certain of offspring)
- more likely to abuse step-children
- more likely to abuse handicapped children
- females more likely to invest in offspring (more certain of offspring)

Children[1][2]

- infants id human face
- infants imitate human expressions
- young children prefer adults
- older children switch (girls before boys)
- adults respond to child crying (females more than males)
- children engage in rough play (differs from real violence)
- submissive / dominate behaviour

Ethnocentric Behaviour[1][2] [4][5][6]

- tend to prefer own group "we"
- tend to dislike "not we" (such as dehumanise, bystander effect etc.)
- children afraid of strangers

Language[1][2]

- predisposition to learn a language

Physical Appearance[1][2]

- tenancy to prefer more physically attractive people

Kin Selection [7]

- The tendency to prefer genetic relatives over non-genetic relatives

Morality / Justice [8][16][17][18][19]

- a sense of morality
- tendency towards egalitarianism

Self-Deception [9][10]

- tendency to find patterns

- tenancy for false positives

Anthropomorphism [11][12][13][14][15][10]

- tenancy to attribute human behaviour, motivation and other characteristics to non-human animals and inanimate objects
- tendency to understand the world in human emotional terms

Violence[2]

- use of violence in conflict resolution
- use of violence for gain
- use of violence for self-defence
- honour

Genetic Origins of Behaviour[20][21]

- inheritance of behaviours
- evolutionary persistent behaviours
- spices specific behaviours

Environment and Behaviour

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We all live on one planet!![6]

6 The Dymaxion (or Fuller) projection shows our planet as one.

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