



The next phase of civilisation:

Post-scarcity

through

Open-source design

and

Advanced automation



Post-scarcity through Open-source design and advanced automation

This talk is distilled from my attempts at some holistic thinking over the last few years.

Going back to first principles and trying to understand the limits of what is possible employing current technological knowledge and the open-source development model applied to the physical world.

Aimed to be food for thought...

Overview

- **Open-source design**
 - Design tool-chain
 - From virtual designs to physical objects
- **Advanced Automation**
 - Self-maintenance, repair
 - Automated infrastructure
- **Fundamental resources**
 - Material
 - Energy
 - Information
 - Intelligence
- **Post-scarcity**



Open-source design

- Applying principles from the FOSS movement that provides a powerful new way to design physical objects, machines and systems.
- Nascent field with huge potential to radically alter the way we create goods, machines and systems
- Not only for personal or community items but all the way up to components of national or global infrastructure
- Potential to supercede limitations of commercial forms of production entirely



Tool-chain

Requirements for widespread adoption of O.S. design:

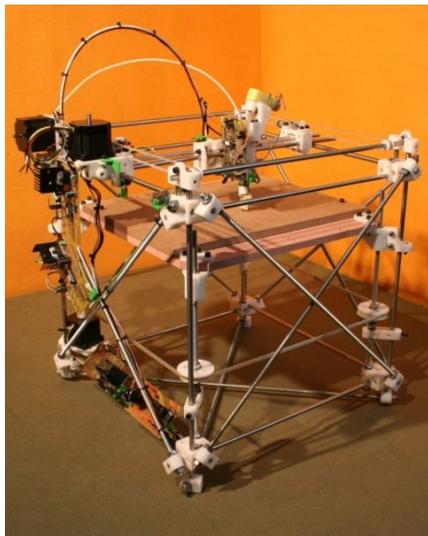
- User-friendly CAD – lower barrier to entry – not just for geeks
- Collaborative functions
- Easily accessible commons of objects and components
- Analysis and simulation
- Easy interface to CAM, both local and remote
- Doesn't currently exist, but likely to emerge soon

Also easy physical replication...



Virtual designs into physical objects

- Virtual designs need to be brought to life as physical objects. Expensive and slow compared to compiling or downloading software
- However atoms are starting to catch up with bits in terms of ease of duplication
- Ever increasing (and evolving) array of computer-controlled fabrication techniques, both small and large scale



Virtual designs into physical objects

Some options for fabricating virtual designs:

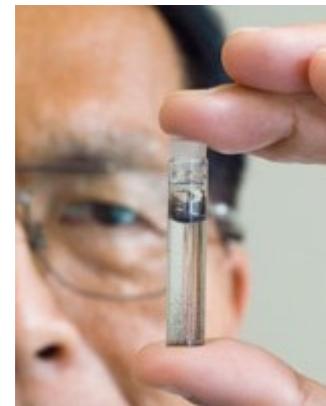
(current and future)

- Get your hands dirty and craft it yourself or in a group
- or use someone else's hands – e.g. local engineering firm
- Personal fabricators (additive fab., CNC, sheet material cutters)
- Use of local FabLab (commercial facilities emerging too)
- Mail-order fabricators (e.g. eMachineShop)
- Contract manufacturing (bulk order with others)
- Automated construction – (Contour Crafting)
- Products of fully automated economy



Advanced automation

- Proper automation
 - no humans required in the loop for normal operations
- Self-maintaining and repairing
 - modular components replaceable by machine. Parts containing tiny embedded sensors for failure diagnosis. (Super-advanced AI not required to run these systems)
- Developed and controlled by people, using open-source design
- Ultimately scalable
- Enable entirely new things not previously feasible



Test tube full of Hitachi 'RFID powder' (Mu chip) 0.05 x 0.05 mm.

The shape of solid-state sensors to come?

Automated infrastructure

General trend seems to be towards distributed solutions, but industrial systems likely to remain to some degree.

Apply advanced automation to:

- Mining
- Material processing
- Large scale energy generation
- Transport systems
- Agriculture
- Environmental engineering
- Certain ultra-sophisticated manufacturing and operations
(e.g. jet engines)
- Certain safety critical operations
- Large scale robotic fabrication – buildings, ships, rail etc



Fundamental resources

So what have we got to work with?

Mankind's fundamental resources are:

- Energy
- Material
- Information
- Intelligence



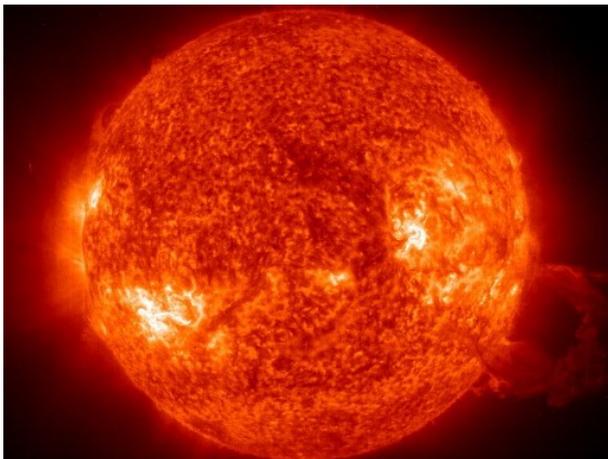
What we are able to create / do depends only on these things

Present systems of civilisation suffer from unnecessary layers of complexity (for historical reasons) which only add friction, inefficiency and informational 'noise' – only helping to obscure the big picture, and restrict what is actually possible.

1. Energy

The energy available from solar and geothermal alone far exceed our current energy requirements and could sustain humanity indefinitely.

Steadily increasing energy efficiency due to improved system design should become a significant factor in our energy usage.



2. Material

Air, water and the twenty most abundant elements in the Earth's crust provide almost all the material needed to create the multitude of machines and goods that mankind requires:

- Food, medicine, houses, vehicles, robots, industrial machinery, computers, consumer goods etc.

Ephemerization – doing more with less

Design for recycling
(design for refurbishment?)

- List of most abundant elements

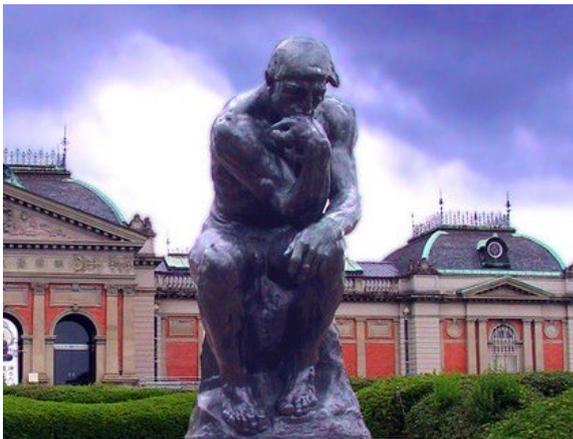
(land, sea and air)



3. Intelligence

Human intelligence

- In short supply?
No, just not using it effectively
- Education becoming more pervasive
- Increasing numbers of brains
- Proposed adv. automation freeing up more people to work on significant problems



Machine intelligence

Increasing exponentially due to:

- Increasing processing speeds
- CPU numbers increasing
- Algorithms and programming techniques constantly improving



4. Information

- Generally not in short supply any more. Amount of critical information being held artificially scarce is dwindling too
- The issue is letting the good information rise to the top to be easily accessed (by both humans and automated systems)
- Information has been first obvious thing to transcend limits of scarcity



Post-scarcity

- What do I mean by scarcity? Significant scarcity. All needs (and most of wants).
- I don't see a free-rider issue, when goods become as easy to duplicate as information
- Advanced nanotech not required
- Transition period – how will emerge and how society copes
- Conventional economics founded on notion of scarcity
- This can all be done with technology and know-how we have today
- Coming from two directions (commercial competition and open-source model)
- Abundance Journal



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Main Page

Welcome to AdCiv.org :: Advanced Civilisation through 'Post Scarcity' :: Post Scarcity through Open Design and Advanced Automation

Introduction edit

We are nowhere near the height of human civilisation.

Not even close. Our present culture is conditioned by centuries of **scarcity** that ought to have disappeared by now considering our technical capabilities.

However automation is surging forwards in terms of sophistication and ability, and in parallel we are developing ever more effective ways of collaborating and openly sharing knowledge. This means it will become increasingly unacceptable to let needless scarcity continue in the face of what is possible – new thinking and tools are emerging that could change everything.

Via the internet a new fluid grouping of minds is evolving that is adhoc, distributed and mutually sharing – a system that is potentially far more effective at problem-solving and creative technical development than anything that has come before. **It is the new enlightenment.** In some areas, notably **software development** and **knowledge gathering**, it is well under way – but this is just the beginning. These 'open' peer-to-peer activities are about to burst out into the physical world enabling us to do things both technologically and economically that have not previously been feasible.

AdCiv.org is exploring the emerging possibilities, focusing on concepts that could take us to the next logical phase of civilisation – namely an ecologically sympathetic **post-scarcity age** where abundant resources, tools and knowledge can be freely shared. It may sound far-fetched to the uninitiated but the technologies to enable this are developing rapidly, so you might want to prepare yourself...



Open collaborative design edit

Open collaborative design involves applying principles from the remarkable free and open-source software movement that provides a powerful new way to design physical objects, machines and systems. All information involved in creating the object or system is made available on the Internet – such as text, drawings, photographs and 3D **computer-aided design** (CAD) models – so that other people can freely re-create it, or help contribute to its further evolution. It is essentially the same principle that is used to progress scientific



Advanced automation edit

Advanced automation here refers to sophisticated systems capable of self-maintenance and repair, needing almost no human interaction to operate, apart from top level guidance. Not being reliant on human effort to scale, these systems when linked together (using an automated transport network) would hugely magnify our capability for production, allowing us to create as much of anything that is needed while releasing people from mindless labour.



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