



## Globalization and Open Source Nano Economy

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In this essay, I wish to raise my concern over some of the problems of today's world, and try to suggest how they can be eliminated, or at least their negative impact be reduced, by developing operational worldwide molecular design and manufacturing capabilities.

The Unabomber Manifesto ("Industrial Society And Its Future") by Theodore Kaczynski is one of the most interesting documents of our times, in terms of both its history and its content. Thanks to the work of Information Technology pioneers such as some of the people he targeted, you can read the full text of the Unabomber Manifesto online. Quoting from the *Wikipedia* article:

The main argument of Industrial Society and Its Future is that technological progress is undesirable, can be stopped, and in fact should be stopped in order to free people from the unnatural demands of technology, so that they can return to a happier, simpler life close to nature. Kaczynski argued that it was necessary to cause a "social crash", before society became any worse. He believes a collapse of civilization is likely to occur at some point in the future; thus, it is better to end things now, rather than later, because the further society develops, the more painful things will be when the collapse occurs. If it does not occur, he says, humans will have the freedom and significance of house pets, although they may be happy, in a society dominated by machines or an elite social class.

I am (and you are, I hope) definitely against Kaczynski's final determinations. However, I have to agree with most critics who say that the Manifesto is very well written and that its conclusions, flawed as they are and despite the horrible acts of murder they spawned, are based on a well articulated analysis of some of the problems of today's world.

One of Kaczynski's central points is that the 'natural' social and cultural environment for a human being is a relatively small community, not too dependent on the outside world for any necessary resource, where everyone has a chance to know everyone else and to actively contribute to the life of the community. He claims that an interconnected world in which the quality of each person's life depends on things that take place far away is dehumanizing and

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cannot work without decreasing the freedom, the rights, and ultimately the happiness and well-being of people. He argues that the very technologies needed to sustain a globalized world contribute to creating more dehumanization. This produces a runaway feedback loop that can only result in an unnatural environment, putting far too much strain on our mental resources—and at some point, something has to break.

So, Kaczynski wishes to go back to a world of loosely connected, relatively independent small communities. But this is difficult because in today's world no small community could ever produce all that is needed to meet its own energy, food, communications and health care requirements. Hence, Kaczynski proposes to break the technological foundations of our global civilization by any means, including murder.

The deep interconnectedness of today's world also creates huge geopolitical tensions. The situation in the Middle East is a sad example of what can happen when the economy of one region is too strongly dependent on resources located in another region, and where too many players seek control over the complex planet-wide production and distribution networks crucial to the functioning of our global infrastructure.

(A big advantage of solar energy, and one of the main reasons why its deployment should be pursued much more aggressively, is that it can be produced locally by those who require it. A nation following this route would sharply reduce their vulnerability to hostile actions, and to the blackmail of others based on threatening to disrupt their energy supply. In addition, this would reduce that nation's propensity to wage war against others for the control of energy supplies.)

I definitely do not want to go back to a pre-industrial age as Kaczynski proposes. Indeed, I like many aspects of globalization. I like that in some sense we can all regard ourselves as citizens of One World. I like that with the Internet I can know what happens and what people think on the other side of the planet, and that I can participate in virtual communities held together by common interests and values instead of geographic location. I like to see thinkers and doers from all over the world working together at near-thought speed to develop new ideas and goods.

So, I am definitely not a sympathizer of the anti-globalization movement. But I can see worth in some of the points they make, partly based on Kaczynski's writings. Perhaps we can take their best arguments into account by recognizing that although the option of living in a global interconnected world is good for many, nobody should be forced to do so, and a local community of like-minded people who wish to live their lives in relative isolation from the rest of the world—provided of course they do not oppress their citizens or threaten other communities—should have the opportunity and the means to do so. A good, albeit perhaps extreme, example is in Damien Broderick's *Transcension*.

Another problem of the modern world is that it is very difficult to build effective supranational governance bodies, because existing nation-states, especially those with a long history, refuse to give up sovereignty and power. This difficulty is often seen in the United Nations and in other supranational bodies such as the European Union. Few, if any, of today's nation-states would seriously consider allowing such organizations to have real and effective decision-making power, let alone the means to enforce the decisions made. It appears that a gradual breakup of existing nation states into smaller entities, relatively autonomous but co-operating when co-operation is necessary for all parties involved, will be a necessary

prerequisite for the creation of supranational governance structures including regional and world ‘governments’.

I have given two different but connected arguments for “small is beautiful”. And, speaking of small things, I believe that emerging NBIC<sup>1</sup> technologies, and in particular molecular nanotechnology, will offer the opportunity to retain the benefits of globalization while at the same time significantly reducing the dependence of local communities on the external world as far as the availability of material goods (food, medicines, energy, vehicles, toys, designer items, etc.) is concerned.

Richard Feynman was the first to articulate the possibility of molecular nanotechnology (although not by that name). In his 1959 essay, “There’s Plenty of Room at the Bottom”, he argued that there is nothing in the laws of physics to prevent us from building molecular size machines able to precisely place individual atoms and molecules according to design specifications and build complex structures and chemical compounds one atom at a time. Feynman wrote:

It would be, in principle, possible (I think) for a physicist to synthesize any chemical substance that the chemist writes down. Give the orders and the physicist synthesizes it. How? Put the atoms down where the chemist says, and so you make the substance. The problems of chemistry and biology can be greatly helped if our ability to see what we are doing, and to do things on an atomic level, is ultimately developed—a development which I think cannot be avoided.

Eric Drexler, who popularized the term ‘nanotechnology’ in *Engines of Creation—the Coming Era of Nanotechnology*, was among the first to realize that nanotechnology will achieve its disruptive potential when molecular machines will be able to build other molecular machines by assembling them from atoms and molecules available in their environment. Given replicating nanotechnology, it is easy to see how, with suitable programming and assuming that all needed molecular ‘bricks’ can be extracted from the environment (a safe assumption in most cases), it is possible to assemble any substance or structure for which detailed design specifications are available. So, our future economy will not be based on material goods, but on design specifications for material goods. We already have examples of this today: A document can be transmitted over the Internet and reproduced, on screen or on paper, by whoever has to read it. This technology is available to nearly all consumers, at least in the Western world, at the (relatively) low cost of a PC, a printer, and an Internet connexion.

A VHDL (VHSIC hardware description language) design specification for an application-specific integrated circuit is as good as the device itself in the sense that it can be taken to a suitable hardware foundry and used to reproduce the device with an automated process. The fundamental difference from the previous example is that today one needs very complex and expensive machinery and extensive know-how to generate a physical instantiation of the device. But I think we can safely predict that the costs will drop and circuit printing will become more and more like document printing.

Instead of shipping physical objects, their detailed design specification in a “Matter Description Language” or “Molecular Description Language” (MDL) will be transmitted over

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<sup>1</sup> Nanotechnology, Biotechnology, Information technology, and Cognitive science.

a global data grid evolved from today's Internet and then physically instantiated ("printed") by "nano printers" at remote sites. The usage of nano printers, also called nanofactories, is described in Neal Stephenson's *The Diamond Age*. The term "Matter Compiler" (MC) used by Stephenson in the novel is especially good as, by analogy with the software development process, it suggests the idea of organizing (compiling) matter from design specifications. Reading Stephenson's descriptions of young Nell trying to use her mother's cheap kitchen MC to compile clothes, toys, and mattresses makes it easier to understand the basic concepts of molecular manufacturing.

Assuming it still exists then, the Coca Cola Company will not sell physical cans, but will license the MDL description of its popular beverage for on-site compilation by customers. I assume Coca Cola and all other commercial companies will need some means to enforce their intellectual property rights to make sure that customers pay what they are supposed to pay. This probably will be done by a limit on the number of times a given MDL design can be assembled by a given user, with protection technologies conceptually similar to those used today for Digital Rights Management (DRM). Of course, there will be plenty of 15 year-old hackers willing and able to crack whatever DRM protection scheme manufacturers can think of, and then make available cracked DRM-free design specifications on the global data grid.

I do not see any reason why molecular nanotechnology should change the basic laws of the economy, so I assume that the MDL description of an Armani suit will cost as much as the Armani suit costs today. And I believe tomorrow's designers of luxury items will be perfectly entitled to charge a lot of money for their creations. But what happens if the MDL descriptions of basic goods that a local community needs are priced beyond their reach? And what happens if these licenses are withdrawn for political reasons, perhaps to force a community to submit to an aggressor community or to an overreaching central authority?

Basic goods should be free, or priced within the means of everyone. In other words, Coca Cola can be expensive, but water must be free. Armani suits can be expensive, but basic clothing must be free. Who will develop royalty-free MDL descriptions of basic goods that everyone on the planet can use? The answer, I think (or at least I hope), is that they will be developed with an Open Source development model by armies of MDL programmers.

In the online version of this essay, I make frequent use of *Wikipedia* articles as references for two reasons: first, I am fond of *Wikipedia* as one of the best examples of Open Source development; and second, *Wikipedia* articles are as good as, and often better than, equivalent articles in expensive encyclopedias. I can rest assured that all *Wikipedia* references that I use in this article will be maintained under the spontaneous quality assurance and control processes that are emerging within the *Wikipedia* community, and will be further improved by countless users and experts. So, linking to *Wikipedia* is much safer than linking to a commercial website that may disappear if the owner goes out of business. (If you are reading a hardcopy version of this essay and wish to have further information on the terms and concepts mentioned, please go to the URL "<http://en.wikipedia.org/>" and enter your search keywords.)

It seems likely that many of the arguments used today in favor of the Open Source movement will be applicable to tomorrow's nanotech economy. The availability of Open Source MDL specifications for all basic goods will result, I believe, in a better world—a world where citizens and communities will be free to do their own thing (provided they do not reduce

the right and ability of others to do the same) without having to give in to pressure and blackmail from hostile parties or meddlesome central authorities who threaten to disrupt their supply of basic material goods.

**About the author:**

Giulio Prisco is the Director of the futurist consulting consortium FutureTAG. He is a physicist and computer scientist, and former manager in the European space and defense administration. Mr. Prisco, who also serves on the Board of Directors of the World Transhumanist Association, is based in Madrid, Spain.