

The Process Revolution:
The Internet and the Rise of Commonism
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Abstract: There is a new economic revolution underway which is structurally similar to the industrial revolution. During the time of the industrial revolution, a previously existing but minor element of the economy dramatically expanded into a full-fledged economic factor because of groundwork laid by a cognitive technology. That technology was the printing press, which made knowledge, once only available to scholars in secluded monasteries, royal courts, or libraries, available to all. The new economic factor that it enabled was Capital (mechanized production). The industrial revolution is a name for the coming into being of Capital. The new cognitive technology is networked computers (the Internet), and the economic factor it is enabling is Information (defined as the data plus the patterns and processes that use that data to organize production). The process revolution is a name for the coming into being of Information as an economic factor. What the printing press did for Aristotle's "epistome" and "techne" (knowledge), the Internet is doing for "phronesis" and perhaps "sophia" (wisdom). The printing press allowed people to understand the world around them by reading encyclopedias, newspapers, textbooks, etc. The Internet is now allowing all of us to be encyclopedists and publishers. This fact is revolutionizing the number and kind of processes we can understand and be a part of, which has as wide ranging economic implications as did mechanizing production.

The industrial revolution led to two major competing theories of how to organize the new economic factor of Capital: capitalism and communism. Likewise we are seeing the emergence of two structurally similar competing schemes for how to organize Information: "ownerism" and "commonism." Commonism is the preferable choice for the process revolution because, like capitalism, it both maximizes the dignity of the individual and (like the Internet) "pushes the intelligence to the edges,"¹ for decentralized decision making. But unlike capitalism, commonism works with, not against, the fact that Information is naturally abundant. Finally, the main informational tool of industrial revolution, what we call money, has the potential to undergo massive positive transformation under commonism.

There are a series of what biologists would call homologies, and mathematicians would call isomorphisms between the industrial revolution and the process revolution: 1) An existing but insignificant aspect of production expands rapidly to become a major economic factor. 2) The expansion is activated by a "cognitive" technology. 3) There are two facets of the "cognitive" technology, an embodiment facet, and a distribution facet. 4) The expansion gives rise to competing philosophical approaches to the new economic factor.

¹ See David P. Reed and Andrew Lippman's paper *Viral Communications* for a detailed presentation of the power of edge based networks (<http://dl.media.mit.edu/viral/viral.pdf>).

Examining the benefits and downsides of the historical approaches to the rise of a new economic factor allow us to choose the approach to take this time around as history does seem to be repeating it-self.

The expansion of Capital and Information:

In the industrial revolution the tools of production (formally Capital), grew from being an insignificant aspect of the economy, to being a major economic factor right along with Land and Labor. Before the industrial revolution Capital existed in the form of things like hand tools, and small workshops (mills, smithies, wheel-wrights, etc) but these were a very small component of economic activity in comparison with the role of raw materials (Land) and the human effort of converting them into the necessities of life (Labor), and were easily made and wielded by individuals. After the industrial revolution the necessities of life for most people are produced only with the involvement of Capital (factories), and such Capital is not within reach of the individual, it is both built, and wielded collectively.

With the process revolution, the economic factor that is undergoing rapid expansion is information. Just as Capital (with a capital C) has a formal economic definition (the tools of production, or those items we produce not to consume, but to create more production) a more formal economic definition of Information (with a capital I) is: the information plus the patterns and processes that use that data to organize production. Used in this sense, Information is more than data, i.e. it's not just the bits on a CD that are music. Computer software is perhaps the clearest example of Information in this sense because it is both data and process. Information has always been part of production, but information was not itself a significant independent factor in production of necessities, because it has been within reach of the individual. Before the process revolution the data and the patterns and processes of Information were held in the heads of individuals. The process revolution results in their transfer into machines. For example, modern production is built on such information processes like just-in-time delivery, where the key factor in production is not the physical tools, but rather the information processes that organizes their operation. As in the industrial revolution, Information is no longer the province of the individual, but is built and wielded collectively.

The cognitive technologies:

In both revolutions, the key transformative factor is the introduction of technology that affects human cognitive ability on a mass scale. In the industrial revolution that technology was the printing press. When knowledge could be mass-produced and made available to most people, our cognitive ability as a species was transformed. The industrial revolution required the mass production of knowledge to distribute the advancements of science. Another way of looking at it is that the industrial revolution is the result of the feedback loop that happens when the discoveries of science are distributed into the world which drives huge increases production, which then drives more science. This cycle is built on publication, and it only becomes the exponential spiral that makes for a "revolution" when it is mass publication. It's crucial to note,

however, that the revolution is not just quantity of information, but it's the pattern shift that is enabled by that quantity.

In the process revolution the key transformative technology is the networked personal computer. This cognitive technology is not simply an expansion of the printing press, rather it is a technology of an entirely different order, or, using the terminology of Russell and Whitehead, it is of a different logical type. Both technologies exhibit the facets of embodiment and distribution of a cognitive ability. The printing press is a technology that takes information, and puts it into a physical form, but it's not just about making it easy to create one book, but rather the ability to create many books just as easily as it is to create one, that makes it a transformative technology. Similarly the computer allows for the embodiment of a pattern, or a process. Just as books existed before the printing press, so did machines that could embody pattern and process. In fact one way of looking at it, is that each machine is just that, and embodied pattern or process of production. What is unique about the computer is that it is a tool for embodying processes in general. Just as the printing press can print many different books, so a computer can execute many different processes. The network is the second distributory facet of this technology that makes pattern and process available to all.

Aristotle provides some helpful terms for thinking about the cognitive technologies. In his Ethics, he distinguishes a number of intellectual virtues, among which are episteme: empirical knowledge; techne: technical knowledge, or craft skill, (which became the root of our word technology); phronesis: practical wisdom; and sophia: theoretical wisdom, or understanding of first-principles. The claim of this paper is that the printing press of the industrial revolution was an amplifying technology for episteme and techne, and that the Internet (short hand for networked personal computers), is an amplifying technology certainly for phronesis, and perhaps for sophia. The first half of this claim is fairly easy to see. The printing press allows us to set down the empirical results of scientific investigation as well as the craft skills we develop, and distribute them. The results of Phronesis and Sophia, on the other hand, are not easily expressible in words. They are the product of experience. They are the ability to match the patterns and processes understood by past experience to current experience and therewith, the ability to make judgments of how to best act in particular circumstances. The skilled doctor, or the skilled entrepreneur must make decisions when information is lacking. They can do so because they have the ability to match the current pattern of a disease, or business situation, with past experienced patterns.

At first blush the Internet just seems like a hyper printing press. For example, it appears that the Wikipedia is just a very efficient, very large encyclopedia, and that blogs are just very large and very efficient journal publication system. But that's only because we are still looking at this technology through our old eyes. If we look at this from a different angle, we see that what we really have created is a tool to make encyclopedists and publishers of all of us. The printing press has already made scholars of all of us. Because of publication, the average college graduate of an industrial society probably has an order of magnitude more scholarly information in their heads than all but the very best scholars of pre-industrial societies. The printing press created the knowledge society

powered by the ability to organize matter for the benefit of economic activity. The Internet has the potential to create the Wisdom society, powered by the ability to organize Information for benefit of economic activity.

Capitalism vs. Communism:

The rise of a new economic factor with the industrial revolution produced the two rival economic orders of Capitalism and Communism which are both fundamentally answers to the simple question of what to do with that new economic factor. The question was: who should own Capital and the products produced by Capital. Communism proposes common ownership in the form of the State, and Capitalism proposes ownership by individuals.² The justifications for choosing one way or the other are of course lengthy and varied as are the descriptions of why Capitalism largely won out. However I would propose three main systemic properties that account for its success: 1) Both theoretically and in how it is perceived (though perhaps not in practice) it maximizes individual dignity and potential, 2) like the Internet, it "pushes the intelligence out to the edges." The first property allows it to have maximal psychological appeal. It's much easier to adopt a system that appeals to, and in fact systemically works with people's natural self-interest. The second allows it to have maximal efficient functioning. It's much easier and more effective to adopt a decentralized system that allows for local decision-making where local information can be used to maximum advantage.

Both of these initially adaptive individualist and decentralist properties play out very differently in the end game of the industrial revolution because they end up conflicting with the common good as the system scales to a single planetary economy. The built in focus of Capitalism on the individual makes it very difficult to solve problems of the commons. The arguments that point to the systemic truth of this claim have been made very cogently elsewhere, but I'll point to two interesting facts: 1) The corporation is legally an individual, a single person. This odd fact (that a collective body would be treated legally as a single person) is not so strange when we keep in mind how Capitalism answers the question of what to do with Capital. 2) Our collective bodies (governments and corporations) have solved the problem of massive scaling through complex hierarchical organization, which have in practice erased the benefits of decentralization inherent in the original Capitalist ideals. Corporations and Governments are now so large that both of them are forces for disempowerment of individuals, but event worse, they have theoretically grown beyond their capacity to manage the complexity of the environment they live in. This limitation is not simply one of the particular governments or corporations, but as is well described in Jean-François Noubel's work on Collective Intelligence³ is inherent in such hierarchical systems when they grow to their current level of complexity.

Commonism vs. Ownership:

² It's worth considering how the earlier economic systems of Feudalism, Kingdoms, Tribes, Hunter gatherers answered this same question about the other economic factors. Labor and Land have variously been owned by the kings, individuals, States, the commons, and more.

³ http://www.thetransitioner.org/wiki/tiki-download_file.php?fileId=3

It is not surprising that at the present time we are seeing large conflicts over how Information should be treated. Our natural mode of thought comes from the Capitalist answer to what to do with the previous new economic factor, which was to say that it should be owned by individuals. The common names used for the new economic factor (what was called Information above), are the names from the branches of law used to enforce that individual ownership: intellectual property, trade secrets, copyrighted material, patented processes, trademarks etc. All items covered by such terms are Information.

A different answer to what to do with Information is practiced by the open source movement, where its key product, software, is the purest expression of Information as defined in this paper: the processes and patterns used for production. The open source movement is disdained by many simply because of the clearly communist flavor it appears to have as a result of its rejection of individual ownership of the new factor of production. However, the open source movement answers the ownership question differently than communism did. Instead of placing ownership of Information in the hands of a State, the open source movement effectively (through various interesting legal maneuvers)⁴ places ownership in the commons. This is actually a new possibility that wasn't available to Communists for Capital. The State was a stand-in representative for the commons when the commons was about a scarce resource that needed to be protected. In the modern era, the Information commons doesn't need protection by the state. Instead the function of the government has taken the opposite role; that of protecting the enclosure of the commons into the hands of the few.

History is, as is often claimed, repeating itself, but it's probably not a circle that comes back to the same place, but probably a fractal in which the same patterns appear, but in a modified form. So this time, as history is repeating itself, the choice of placing ownership of Information in the commons is the one that both maximizes individual dignity and potential, as well as "pushes the intelligence out to the edges" by allowing decisions to be made at the point maximal effectiveness. This claim could be argued in great depth, but I'll leave it to simply pointing out that the underlying reason why it is true, is that Information, unlike Capital, has the natural property that once it comes into existence, there is little or no further cost to maintain it. A factory requires continual input to operate, and no factory can clone itself. All information in digital form has a very different behavior; the cost is entirely up-front. We need to examine carefully the systemic economic effect of locking up the value of using something that has little or no on-going cost (royalties on software, etc). The competition that reduces the price of production of goods "commodity" levels, does not happen when you can own the Information of production.⁵

⁴ For examples see the Gnu General Public Licensing (<http://www.gnu.org/copyleft/gpl.html>) & Creative Commons (<http://creativecommons.org>)

⁵ It is interesting to note that the initial intent of the patent system was also a form of open source meant to solve this issue because its main purpose was to create an incentive to not treat Information as a trade secret, which ironically it did by granting limited time ownership rights to Information in exchange for complete open disclosure.

There is another practical reason why the Communist approach to Information is likely to be more effective than the Ownerist approach, which is analogous to how Capitalism works with, not against people's natural self-interest. Commonism operates in sync with the natural abundance of information. It's hard work to enforce copyright and patents. It's very hard work to create "digital rights management" systems. It's virtually impossible to prevent piracy. Adam Smith saw the systemic possibility of embracing self-interest and putting it to work for the common good. The result was Capitalism. The open source movement and its many off-shoots are embracing the natural abundance of Information and the propensity of Information to flow everywhere, and are putting these facts to work for the common good. Another way to look at this is that Information is not subject to the tragedy of the commons. One person's use of Information doesn't diminish anyone else's use of it. Information isn't used up, thus it is most naturally held in the commons.

Money:

It is not possible to consider the rise of Capitalism without also examining money. The fact that common usage of the term capital is the same thing as money, instead of the more formal "tools of production," is an indicator that this true. As has been amply shown elsewhere⁶, money is actually a form of Information. This fact is hard to see because in its current form, it is an Information system that has been carefully structured to allow it to be controlled to mimic the scarce natural resources that used to back it (by such actions of the Fed as raising interest rates). Doing so has the perceived virtue of keeping it scarce enough so that it will maintain its "value." But that whole view, that money is inherently valuable, rather than simply a record of value transacted, is a mistake with gargantuan repercussions.

This paper has claimed that Information was not a major economic factor before the process revolution so it seems odd to then claim that money is a form of Information since money certainly has always been a major part of our economic system. However, money is not the same type of animal as the factors of production, Land, Labor, Capital and now Information. This is because money and its development in the forms of finance and capital (little c) is rather the infrastructure that underlies and enables the activation of the factors of production. The fact that this infrastructure is itself Information in the formal sense necessarily has major ramifications as Information becomes one of the economic factors of production.

It should be no surprise that the ownership of the monetary system follows the same pattern under Capitalism as we have seen was applied to Capital itself and is also now being applied to Information. The monetary system is not owned by the State, it is owned by individuals, i.e. private banks⁷. There is, of course, some State influence on the monetary system itself, but none-the-less, its ownership is in private hands. It's very

⁶ See Tom Greco's: *Money* and Bernard Leitaer's: *The Future of Money*

⁷ It is not common knowledge that the Federal Reserve Bank is held privately, and is only partially governed by the actions of the federal government.

interesting to note that that influence (in the form of the Fed's raising and lowering interest rates) is all about manipulating the money supply, which really is about controlling the relative scarcity of money to either try and match it to current actual economic productivity or to influence the direction of that productivity. These are manipulations of an information system. This paper is not the place for a detailed rehash of the relative merits and problems of the current system. But it is the place to point out that the evolution of the monetary system has followed the same pattern as the evolution of corporations and government in that as it has scaled up to handle the planetary scale of the economy, it has systemically outgrown the capacity of remaining stable⁸, and furthermore, it has also become a force against achieving the goals of maximal individual dignity and potential. Instead the current model ensures the centralization of decision making about the monetary system and thus the benefits of its ownership into the hands of the very few. Because money is the Information infrastructure that underlies all economic activity, solving these two problems is crucial.

Because money is Information, the Communist approach to its ownership will also be to place it into the commons. This does not mean that it would be appropriate to attempt to take away ownership the current system by the banks and put it in the hands of the State.⁹ Rather, the appropriate action is to build a new more complex system that builds on money's inherent nature as Information. And in fact, doing so has a completely "capitalist" feel, which really is to say that there is no reason that the monetary system itself shouldn't be put out to be evolved by competition in the free market, just as any other aspect of business is. And in fact, there are a number of efforts under way in the field of community currencies to do just this.

Conclusion:

Not surprisingly, technologies that transform our ability to think also give rise to new mechanisms for providing us our daily bread. The politico/economic systems that we put in place to govern this change revolve around the sticky issues of who and how control (also known as ownership) of those mechanisms is parceled out.

This abstract mechanization of process calls for a new understanding of what the commons is, and how to allow for its common control and ownership. It is not clear how this will shake out. As was pointed, Information, as distinct from Capital, costs next nothing once it comes into existence. But bringing into existence is not cheap, which raises is the question of investment. The open source movement has proven that it is possible to distribute investment very broadly. But it is very likely that the volunteerism modality of this work so far, will be replaced by new mechanisms that compensate participation in more direct ways than simply the pleasure of getting to use the software you help build, or, as is the case for many business that subsidize work on open source projects, the hope that it will pay off indirectly. Such new investment mechanisms will undoubtedly be built on top of monetary systems that themselves were created, in and owned by the commons.

⁸ Bernard Leitar [Insert Bernard's figures on monetary collapses here]

⁹ Exactly this approach is advocated by some monetary reformers, notably Stephen Zarlenga