Technology and Globalization

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*I*ntroduction The degree to which the ongoing transformation of the world into a single global market has been represented as a natural and inevitable process indicates how successful that project has been so far. As a result, opposition to this process is often seen as a quixotic crusade, quaint and poignant but ultimately irrelevant and dismissible in mainstream debates. But the origins of this appearance of inevitability are not clear: how does a process arising from a set of political and economic decisions made by humans come to be represented as natural? The factors that contribute to this illusion are no doubt complex and numerous, but one such factor—the understanding of the role of technology—can be identified as central.

Technologies are often seen as the physical manifestation of natural scientific truths, and if the operation of the technologies is understood as requiring a certain structure of social relations, then the conclusion must be that the existing structure is the only option available for society. The social forces that they support can appear to be in accordance with the way the world works, in some apparently objective sense. The source of the historical change can be identified as the technology itself, since its introduction can be represented as inevitable, since it merely manifests objectively existing powers in nature. This line of thought, known as "technological determinism," is one of the most important forms of ideology behind the contemporary neoliberal discourse, constituting a new form of reification: the tendency to make social relations and the products of human decisions look natural. This essay examines this idea and its deployment, and attempts to present a more critical understanding of the relationship between technological development and political and economic change.

The rise of global capitalism has come at approximately the same time as the particular rapid introduction of new information and communication technologies: personal computers, the Internet, the world wide web, and associated technologies such as satellite communications networks. This concurrence has put capital in a position to make the most extensive use of them, so that the technologies themselves appear to be part of capitalism itself; as if the expansion of capitalism and technological progress were two ways of describing the same thing. Certainly these technologies are at least compatible with, and facilitate the expansion of, capital's power. The practices of flexible production, instantaneous transnational financial transactions, and many other new features of capitalism, rely heavily on these technologies. But the compatibility of the new technologies with the dominant powers in society itself can't make those powers appear natural. This requires representing the transnational expansion of capital as the necessary response to the inevitable introduction of these technologies.

In official discourse, as well as in popular discussions, this position is becoming the common sense of our times. Society must keep up, we are told, in the information age, because if we do not adapt to the new reality with its new technologies, we will be left behind and will suffer for it. Asking whether or not it is desirable to adopt these new technologies has become simply unthinkable.[1]

Technological determinism appears to rest on two different assumptions. The first is the claim that the development of technology is an autonomous force, which is independent of human control and proceeds according to its own logic. This second is that the social implications of a technology are a result of its technical characteristics, and can be understood by investigating the way the technology works. When combined, these two claims imply that the structure of a social order is a response to the technological development that occurs in that society. Both are fundamentally unreasonable claims, but it is the conjunction of the two ideas that operates ideologically.[2]

The current conjuncture of the introduction of the digital media and capitalist globalization gives technological determinism a special importance, but is not new. It was used to

explain historical change long before the development of the Internet, and has been an important theme in popular culture for over a century.[3] In academic discussions of communications technology, it achieved its best-known expressions in the work of Harold Innis and Marshall McLuhan, who made careers out of deriving the characteristics of different historical epochs from the communications technology used in them, most notably linking the development of the printing press and rise of modernity.[4] Even some Left theorists have adopted this position. Many have interpreted Marxism within this framework,[5] and some continue to think of new technologies this way. In a recent exchange with Ellen Meiksins Wood, A Sivanandan goes so far as to claim that not only is it the case that, as Marx once said, "The handmill gives you society with the feudal lord and the steam engine gives you society with the industrial capitalist," but in fact "the microchip gives you society with the global capitalist."[6]

Often, technological determinism is posited in opposition to an instrumentalist view, which holds technology to be a neutral tool which serves whoever controls it.[7] In this approach, technology's role in serving existing powers is primary, and many discussions of the impact of technology focus on this.[8] Such a view is, however, not adequate to deal with the complex relationship between technologies and economic orders, since most technologies can be used for purposes that have little to do with reinforcing the power of the dominant social forces, and many can also be used to oppose that power. Different technologies often facilitate certain kinds of social relations, and to the extent that this is true, technologies may have some politics embedded in them.

Manuel Castells' Framework A more critical understanding that allows us to deal with the complexities of different technologies, but also avoids the fatalism implicit in technological determinist explanations, is clearly needed. One recent attempt to formulate such a theory which has received considerable attention is the work of Manuel Castells' trilogy, "The Information Age: Economy, Society and Culture." Castells' work is a good starting point for a discussion of the political implications of the new technologies; it represents probably the most comprehensive and empirically detailed

yet theoretically developed discussion of the implications of the digital media to appear so far, and has been widely read and received positively by many reviewers.[9] His theoretical framework, however, requires careful consideration. Unfortunately, he is unable to use this framework as a basis for a critical study of globalization without lapsing into deterministic explanation. After a quick summary, I will attempt to show how this failure takes place, and then make some suggestions as to a more satisfactory alternative.

Castell's framework is not actually original; it is derived from Daniel Bell's discussion of post-industrial society. This perspective holds that social orders have two essential characteristics, which are referred to as their "mode of production," and "mode of development."[10] Both of these shape the way society functions and changes, but neither controls the other. Their mutual interaction holds the key to explaining historical changes such as the current transition to what he calls the "Network Society."

Castells follows Bell's use of the term "mode of development" to refer to the way that goods and services are produced, and the term "mode of production" to describe the way that surplus is distributed and consumed. Development is either "pre-industrial" (or agrarian), industrial, or informational (Castells' new term for Bell's "post-industrial."[11]) Modes of development are distinguished by their "source of productivity:" in agrarian development, productivity comes about through increased cultivation of land; industrial development utilizes new sources of energy, and informational society applies knowledge and information as sources of "productivity." That this accords with a popular understanding of history, whereby the past is divided into ages based on the technology of the time—the stone age, the bronze age, the iron age, the steam age, and now the "information age"— indicates the extent to which technological determinism penetrates popular culture.

Since by "mode of production," Castells means something different from what Marx means, it is not clear what different modes there could be. He only ever discusses two possible modes, which he calls "statist" and "capitalist." In the former, distribution of the surplus is controlled by state elites, who use the surplus generated to further the goals of the state,

which are centred on the extension of its own power. The latter is defined more conventionally, (surplus is distributed on the basis of profit-maximizing) but never analysed on its own. Nowhere does he mention the possibility of other modes of production, such as feudalism, or the possibility of a co-operative social order.

These two characteristics of the social structure form the basis for the social order. The emerging network society is based on "informational capitalism," a combination of the informational mode of development and the capitalist mode of production. For Castells, this is, although still capitalism, a very different kind of society from industrial capitalism, with its own ways of working, thinking and experiencing the world.

Information technologies have their most direct impact on the organization of business: the unified, vertically integrated corporation is being transformed into the "network of firms" linked together by joint ventures, interlocking ownership, and flexible relations with subcontractors all in touch through electronic mail. Instead of centralized control of the entire development, production, marketing and retailing of products, the process is divided up, fragmented and distributed through subcontracting which relies on financing of operations with virtual capital that flows digitally around the world without any real instantiation.[12]

This transnational economic activity leads to the dissolution of national identities, to profound changes in what he calls "patriarchalism," to the rise of myriad social movements based on defensive communal identities, and even to changes in the way we experience space and time.[13]

All of this, he argues, is the result of a change in the mode of development, not the mode of production. He is clear that the social order remains capitalist, at least for the part of the world that has been capitalist. But he holds that the shift in the mode of development is capable of altering the mode of production - in some circumstances. In the former USSR, the old state was simply incapable of developing in the new mode. This, among other things, led to collapse of the order based on the statist mode of production, and its consequent replacement with an order capable of functioning according to the rules of the new technologies and the "network society" based upon it.

Problems with Castells' Framework It should be remarked, before engaging in the critique of Castells' position, that he is by no means uncritical of the contemporary capitalist order or the network society. He is aware of the kleptocratic nature of the new Russian order, the misery and tragic waste of human potential represented by what he calls the "fourth world," and other terrible aspects of the emerging global capitalist world. The problem is not that he endorses that world, or even that his analysis fails, as he admits, to lead to any suggestions about how it could be changed,[14] but that, in the end, he reproduces the illusion of historical inevitability of the existing path of technological development and, consequently, the inevitability of the global expansion of capitalism. What follows is a look at four ways in which the framework leads to problems.

Exaggeration of the Changes First, Castells' description and analysis of the contemporary global transformation tends to exaggerate the scope of these changes, and consequently to underestimate the important continuities that remain. While he is clear that this shift is not to be interpreted as the replacement of capitalism with some other mode of production, his framework of two mutually interacting axes of social change implies that changes of mode of development can be as significant as changes of mode of production. Just how significant a shift he considers this to be can be difficult to discern. But one way of evaluating the importance of such a change, would be to compare it to other changes in mode of development. The last such change was, in his schema, the shift from agrarian to industrial development. But he doesn't discuss this shift in adequate depth to tell us whether that shift was merely one of change of mode of development or if it was also a change in mode of production. This distinction, while it may seem overly abstract, bears on the question of the relation of industrial technology to the origin of capitalism, and a clear position on it would enable the reader to have a better sense of the relative significance of the present transformation.[15]

To put the contemporary transformation in the same category as the shift from "agrarian" to "industrial" seems to be an exaggeration. That earlier transformation helped to solidify

the power of an emerging capitalist class in a struggle against the ruling class of the time, the aristocracy. But there is no such emerging class now, and so the shift to "informational capitalism" is unlikely to have the kind of profound effects on the structure of power that the rise of industrial society did. At best, it appears that Castells fails to deal with the specific structure of capitalism and the continuity of it,[16] leaving the reader with the impression that today's changes rival those of the emergence of capitalism. This tendency in his analysis not to consider the structure of capitalism seriously is manifested in his terminology as well. He begins by describing the coming social structure as "informational capitalism, but quickly abbreviates this (without any disclaimer) to "informationalism." Brevity is of value, and the fetishization of terminology is a problem to avoid, but in this case it seems that the capitalist nature of the informational society, and hence the continuities with the past, are secondary to Castells.

His emphasis on the new ways in which corporations are being organized clearly illustrates this problem. For him, the "network enterprise" is now replacing the vertical, hierarchically structured corporation: "the main shift can be characterized as the shift from vertical bureaucracies to the horizontal corporation."[17] The "horizontal character of the corporations refers to both the relations between firms, and within them. Given the fact of the continued monopoly exercised by large corporations such as Microsoft over the PC software market, and the creation of such huge centralized corporations as AOL-Time Warner through massive mergers in recent years, this first sense of horizontal would seem not to apply generally.[18] In the second sense, he notes that (some) employees in firms such Cisco are able to exercise more power than was traditionally the case, as a result of their possession of particular skills,[19] but for workers without those skills, most firms are likely to appear just as vertical and hierarchical as ever.

Microsoft may serve as a helpful example here as well. Their workforce is divided into a core of highly-paid permanent employees with benefits and stock options, and a much larger, lower tier of temporary employees with no benefits, stock options, or security. While many of that lower tier might prefer the flexibility of contract work, enough of them

were dissatisfied enough to launch a discrimination lawsuit against Microsoft.[20] And this seems to be a particular habit in the "new economy;" the proportion of temporary workers in Silicon Valley is triple that of the US as a whole.[21] For Castells what is significant is the novelty of the "network" as a social phenomenon, while for those who continue to experience alienation and exploitation, the lack of change might be said to be more significant. Castells' approach underemphasises the class relations in which power operates and emphasises the relations within the capitalist class which organize their activity instead.

Levels of Analysis Apart from the manner in which they distract attention from important continuities, Castells' categories for analysis of technology, history and society contain a further problem. Using Bell's classification of social orders in terms of both "mode of development" and "mode of production" to avoid reductionism does not help clarify the relation between technology and social changes. He is not merely overestimating the scope of the current transformation, but also making it impossible to explain many historical examples of social transformations.

For instance, if social orders can be described according to the mode of production and the mode of development, then how can we explain changes within industrial capitalism? There is no way to explain, or even refer to, the important transformation from the competitive capitalism to the monopoly capitalism of later times, or the rise of the welfare state. Even without engaging in the debates surrounding different stages of capitalism; it is enough to point out that "industrial capitalism" is not nearly so unified a social structure, as Castells implies, and that more analysis of its own internal dynamics is needed.[22]

What Castells calls modes of development, setting them up on their own independent axis and describing them as sources of historical change, would be much more helpfully understood as stages of one particular mode of development, capitalism. This might allow us to compare contemporary social changes to earlier shifts in capitalism, such as the rise of Fordism, and to analyse it as such, instead of the exaggerated way in which Castells characterizes them.

One reason for Castells' inattention to these previous shifts might be his excessive emphasis on technology. Since the emergence of Fordist, monopoly capitalist, and imperialist phases of capitalist economic organization weren't closely associated with any specific technological revolution, Castells does not give them adequate consideration.

Technological Determinism Returns Castells is not able to explain the changes he sees without attributing some independent power to technology, as a force of its own, and thinking that its technical characteristics determine its social implications. This is implicit from his introduction, and arises in several instances. Here it suffices to discuss two: his reference to the governing structures of the Internet, and his explanation of the collapse of the USSR. The first is based on a problematic but very popular notion of the anarchic nature of the Internet, and the second makes for a poor explanation of why the Soviet Union collapsed. They both rely on the same unhelpful notions of the autonomy of technology and contradict many of the things Castells says elsewhere about the importance of the social context of the introduction of new technologies.

Claims about the extent to which the Internet is ungovernable and inherently free need to be considered very carefully. Castells claims that:

> In 1999, there was no indisputable, clear authority over the Internet in the US or in the world—a sign of the freewheeling characteristics of the medium, both in technological and cultural terms.[23]

This claim reflects a very common but naive impression that cyberspace is an inherently anarchic realm of pure freedom of expression, where censorship is technically impossible. Such claims serve as part of the dominant ideology by which the new technologies are made to appear as liberators of human capacity, despite their actual function.

Some knowledge of how the Internet is run, however, shows that this is not the case. If it was, the Internet would be unable to function. Each computer which hosts information for other computers to access through the Internet must have

a unique identifier for other computers to be able to contact it, just as each house must have a unique address if the postal system is to work. This means that there must be some central list of host computers and their addresses, and that some institution must control that list in order to ensure new computer hosts can be added to the Internet without duplicating addresses. Since that institution is in a position to remove computers from the Internet by deleting them from that list, it therefore has the power to refuse to allow hosts to carry certain kinds of content, so authority can be said to rest with that body. That body is known as the Internet Corporation for Assigned Names and Numbers (ICANN), and it operates as an international non-profit organization, under a contract with the government of the United States.[24]

ICANN describes its own role as merely that of "a technical co-ordinating body"[25] with no political function, and while such censorship powers have not yet been exercised, there are examples of political decisions about the content of the Internet being made. There is, for instance, a two-letter country-code (a so-called Top Level Domain) for Palestine: Internet addresses that end in ."ps" are reserved for computers registered in Palestine, just as ".ca" addresses are reserved for hosts registered in Canada. The decision to create this designation was made shortly after the Palestinian authority started to take over some of the functions of government in the Israeli-occupied territories. It was made by ICANN's predecessor, the Internet Assigned Names Authority (IANA), but had to be approved by the US Department of Commerce before the central database was altered.[26]

Another example is the recent ICANN decision to add seven new suffices, as almost all useful ".com" addresses have been registered. The process of selecting new suffices allowed any organization the right to apply to have their choice considered—upon submission of a $50,000 US for the application fee. The rejection of the ICFTU application for a ".union" domain was clearly not without political implications.[27]

The process for registration of new Internet hosts has been decentralized, in a privatized market of registration for addresses and domain names, making it more difficult to impose authority on the process. But this is a result not of the

technical characteristics of the medium, but of political deci-
sions. There is no reason why the Internet is necessarily
incompatible with centralized government control. Access to
the Internet can be controlled centrally by the state, as it is in
countries such as Cuba and China - and as it could have been
in the Soviet Union, had it not collapsed.[28]

In Castells' version of history, the USSR collapsed because
of "the structural inability of statism and of the Soviet variant
of industrialism to ensure the transition towards the informa-
tion society." The transition to the network society is
described as a process that was simply underway, which then
required the Soviet Union to adapt. Since it was a statist soci-
ety, its economy, oriented around "the maximization state
power," "proved incapable of navigating the stormy waters of
historical transition between industrialism and informational-
ism."[29] The state was too tightly connected to hierarchical
command structures and lacked the flexibility of organization
required by technological advances.

This is a curious thing to argue about a state that, as he
notes, controlled almost all of the technological development
in the country, and a great deal of the use of it as well.[30] The
state was in control of technology, yet it needed to adapt to
new technologies that are incompatible with the functioning
of that state.

Castells is making two claims in such statements, express-
ing the two central claims of technological determinism. First,
he claims that the new technologies were incompatible with
the Soviet economic structure, and second, that the Soviet
Union had no choice but to adopt them anyway, thus forcing
the society to abandon its economic structure. Neither of
these seem to be supported in the form in which they are pre-
sented by his evidence, although his argument can still be
expressed without the determinist framework in which he
sets it.

The first claim may be true, but there is little in the chap-
ter to argue against the possibility that a command economy
might be compatible with the use of digital media. That the
technology allows for greater flexibility does not mean that
its users have to be free from state planning and control:
decisions about when the system takes advantage of the tech-
nology's ability to adapt to new conditions could still be made

centrally, and other adaptations using the technology might be strictly prohibited by law. The technology need not be implemented and governed the same way it is in the capitalist economy of the West, since its political implications are not embedded in its technical characteristics.

The second claim is simple technological determinism, and must be rejected as it stands. But Castells actually doesn't argue this point after expressing it. To explain why the USSR had to keep up technologically, he relies not on some inherent necessity, but instead on external factors such as the need to compete militarily and economically with the capitalist West. But this would have been true even if continued economic expansion in the West had occurred on the basis of the same industrial technology. The role of technological innovation in his explanation of the Soviet Union is, therefore, exaggerated. By setting his argument, which doesn't rely on specifically on the characteristics of the technology, into this framework about modes of development, he ends up making his argument appear in the form of technological determinism, instead of a more reasonable explanation which is contained in the details of the argument.

Non-Reductionism as Ambivalence Castells claims that the mode of development and the mode of production both have influence over the other, but that neither determines the other or can be reduced to the other. So he can be accused of neither economic reductionism, nor technological determinism; but this leaves us without any real knowledge about why things change. To be flexible and avoid simplistic explanation is one thing, but to be evasive is another.

To argue, as Castells does, that technological developments are sometimes fostered or hindered by the state, or by capital, or conceivably by other social forces, while at other times society changes to adapt to new technologies is not very controversial, but neither is it helpful. To say, that technology is neither good nor evil, nor neutral,[31] does not help us understand our world any better—it merely allows us to choose an explanation after the fact. It is as if Marx had argued that social being sometimes determines consciousness, but sometimes it is the other way around. The question that needs to be answered if our theory is to be helpful is the question of

what happens in the case of conflict between the needs of the dominant social forces and the modalities of functioning of new technology. To merely claim that they are both independent of the other is not an answer.

At times, such as his discussion of the collapse of the Soviet Union, he attributes causal primacy to technological progress, despite his attempts to warn against doing so. But in the case of informational capitalism, Castells states that features of the organization of the economy are the "actual determinants of technological innovation and productivity growth."[32] But why this should be the case here and now but not in the Soviet Union in the 1980's is not clear. In one case, the economic order gives way to the new technology, while in another, the economy adapts to technological development. Castells can explain why capitalism is compatible with technological change, but not why it makes such change necessary.

A better explanation has been available since Marx and Engels described the need under capitalism for the "constant revolutionising of production" in the Communist Manifesto. A capitalist economy is not only compatible with the information technology that Castells associates with the "network society," but in fact, because of its inherently dynamic nature as a structure of competitive accumulation, makes necessary further development of (certain kinds of) technology.

Unfortunately, Castells, in his effort to theorize the overall interaction between technology and society in general, is not sufficiently attuned to such specific characteristics of capitalism. Instead, he leaves himself with two different determinants and is able to choose the one of them which suits his needs at the time. If he is explaining why some social order didn't survive, he uses the inevitability of technology as an explanatory factor. If he wants to discuss how technologies are developed in capitalism, he prioritizes the social structure. This is simply bad social science.

Rethinking Determination Since the goal of science is to find explanations, we need a theory that identifies some consistent causal relationship, one that takes seriously the ways in which capitalism shapes the developmental trajectory of technology, yet respects the ways in which technology functions as more than a neutral tool. Much of the difficulty might

be said to originate with the concept of determinism itself. Raymond Williams' analysis of this concept, and its application to the question of the relation between technology and productive relations, provide a good starting point.[33]

For Williams, the concept of determination is not necessarily a problem. Without such a concept, a critical analysis of society, as he says, is not possible. We must be able to make some claim about causal forces that cause things to develop one way or another. The complexity of the social sciences does not mean that we must abandon any attempt to identify consistent causal patterns, but it does require a less rigid notion of determination than is commonly used.

Williams attempts this kind of redefinition by denying that the concept "determination" must be understood to mean complete control by some external forces, and instead emphasises a different meaning of "determine," as "the setting of limits and exerting of pressures."[34] One thing being determined by a second does not, then, mean that the only forces shaping that thing are found by investigating the second thing. So the course of technological development need not be determined by social forces in the sense of its being completely predictable on the basis of, and subservient to the needs of, the dominant economic powers. But it may be determined by the relations among real people, in the sense of developing within the limits set by and in response to pressures from, the structure of those relations. It has some limited autonomy from the economic structure, and its development is not completely predictable, but this doesn't need to be seen as a reason to believe it to be a determinant or cause of historical change.

For such an explanation to be useful, the nature of the autonomy of technology must be described, so that the way it is limited can be understood. At least two sources of this autonomy can be easily identified. First is the unpredictability of the process of invention, which is a product of the creative nature of that intellectual work. Technological development cannot function simply as a tool of power, since the course of that development is not predictable. New devices are not simply invented because the powerful need them. This may happen some of the time, but it certainly doesn't explain why any given technology is devised at a particular time. Generally, a

technology requires certain conditions, of scientific knowledge, and of other technology, before it can be developed.

A second source of the autonomy of technology is the way that technology, once developed, doesn't necessarily function as intended by those that developed it. Since our consciousness is shaped by our social life, it is often difficult to imagine new kinds of social relations that might be made possible by new technologies. And sometimes technologies make some new forms of social relations not just possible, but more practical, and lend power to new kinds of social structures. One frequently-employed example of this is the development of the printing press, originally intended to copy bibles more efficiently, but which certainly had other consequences.[35]

But this autonomy possessed by technology has to be understood as limited by determining factors that result from the structure of relations among social forces. The possibility of new kinds of social relations resulting from new technologies does not imply that those relations will emerge. In a society in which some social forces are dominant, those powers can be used to lead technologies that are developed to serve the interests of those dominant forces. Some technologies may not be developed if they would not be useful to the ruling powers. The recent decision by the Bush administration to deal with an energy shortage by investing in coal and oil production, instead of promoting conservation or renewable sources of energy, which would allow the US to join the rest of the world in ratifying the Kyoto accord on global warming, is a clear example.[36] And when certain technological needs are identified by the powerful, such as the need for new kinds of military weaponry, they are often developed regardless of the cost, or even the technical feasibility.[37]

Control over technological development is not absolute, but the course of technology in the contemporary world is generally responsive to the pressures of capital, and for this reason it makes more sense to argue that technological development is determined, in the sense in which Williams uses the term, by the structure of relations of production.

This does not imply that different technologies don't have different political implications. They can; some technologies are more appropriate for some social structures than others, and decisions to develop one kind of technology or another

are made with these characteristics in mind. Whether a certain technology is developed or not is determined by those decisions, and not because of any historical necessity of technological development. An excellent historical example of this is the decision to replace railways that could be used for public transit with freeways in the United States, (particularly Los Angeles), which facilitate the private use of automobiles.[38]

Capitalism and the Internet   The history of the Internet serves as an excellent illustration of the way in which the development of a technology gets shaped by the capitalist structure of social relations, and demonstrates clearly the ways in which limits are set for and pressures are exerted on the technology by capital and the capitalist state.

The Internet now appears largely a marketing tool: most of the best-known uses applications are commercial. E-commerce websites are the obvious illustration, but most news sources on the web are also supported by advertising, and unsolicited email is often used as a sales tool. This was, however, not always the case; the Internet was originally designed by the US Department of Defence to share information over a network that could survive any one node's destruction. The resulting decentralized network first came to be used by a number of universities, many of which were publicly funded, to support communication between researchers.[39] The world wide web, as a means of sharing graphic images and not just text-based email, was originally developed by nuclear power researchers in Europe. These uses were generally publicly-funded, but their intended use was for specialised purposes.

The surprising capacity of the technology to transmit content of all kinds, however, quickly led to the development of user-friendly formats to distribute information that did not require specialist skills. At this point, it became possible to employ it in ways that were more directly connected to commercial purposes. Since then, there has been a remarkable increase in the speed at which data is transmitted, the amount of information available to users at home and in workplaces, and the number of users of the Internet.

It is evident that it is capitalist competition which has driven the spread of the Internet and the increased affordability of increasing amounts of computing power, as well as the

constant need to upgrade. Competition leads to the continual development of more powerful ways to process information, which then requires users of the technology to purchase new software to access the information which is made available with these new products, and when existing hardware no longer supports the software, it must also be upgraded. Websites have also been driven by profit: originally: they proliferated as companies sought to keep up with competitors' ability to provide information to consumers. Now, the real value of many websites to their owners is not their ability to provide information but their ability to sell advertising space at a competitive rate.

Without this competitive dynamic, it might be possible to direct resources into making access to useful information more equally distributed by ensuring that useful information could be distributed more efficiently using existing hardware before investing in increased transmission and processing speed, by making more useful information freely available, and by encouraging its use in ways that serve the public interest. But these goals were not pursued, and instead we have an Internet that can deliver advertising and commercial entertainment with remarkably high-quality images and stereo sound, but only to those who can afford to purchase the most recent hardware, software, and a high-speed connection. The influence of capital on this outcome cannot be denied.

The extent to which the Internet has been pressured to operate within the limits imposed by dominant social forces can be better understood when it is contrasted with alternative ways in which the technology might have developed. Considering such possibilities can require a great deal of imagination, but even a modest and pragmatic vision for its use might imagine that the technology could serve to increase participation in democratic institutions by making communications amongst citizens more effective. A more radical vision might provide more reasons to think that the technology has potential that could be used in ways different from their current service to capital: free and instant access to all kinds of information and cultural products becomes technically possible. And at least one use of this potential that seems to work against the needs of one powerful faction of the capitalist class has recently generated a great deal of

attention. The recent conflicts over the application called "Napster" are a clear example of this.

Digital information is much easier to duplicate, alter, and distribute than other forms of content. It becomes possible to distribute anything that can be digitized to anyone with Internet access virtually instantly. This potential facilitates the violation of property rights, since most intellectual property can be digitized, making it harder to control. Such a technology could, in theory, make the entire existing recording industry obsolete, and eliminate the need for cultural products—not just music, but films and even written text as well—to exist as commodities on a market. This is the source of the problem for the Recording Industry Association of America in its battle against Napster, which (for 18 months) allowed unrestricted and free sharing of music files between users through the Internet. After a lengthy court battle, Napster has been shut down until it can satisfy the industry's demands that copyrighted files not be shared without some form of payment, that is, that the recordings are recommodified again. Napster, Inc. has in fact been purchased by one of the recording industry firms whose interests are at stake, and it will in all likelihood return as a paid service when technological obstacles to free distribution have been devised.[40]

Another way in which these technologies might be used not to support but to constrain the power of capital is a product of their capacity to record phenomenal amounts of information. Although many, including Castells, have pointed to the greatly increased international flows of finance capital facilitated by electronic connections, there is no reason why the same computers would not also be capable of keeping records of such transactions, and calculating and even remitting a tax on them, to governments, should the will to impose such a tax appear. Such a "Tobin tax" has been proposed as a means of limiting the structural power of transnational capital as well to fund social spending around the world.[41]

But these counter-hegemonic potentials of the technology, so far, have not been realized. By and large, the Internet has not empowered social movements or working class organizations to successfully challenge the power of capital. Cultural goods are still dominated by the logic of commodification, the news industry still ensures that what most people hear

about the world is filtered through the perceptual lens of the ruling class, unions have not become direct participatory democracies in any meaningful sense, and the Tobin Tax remains a dim hope. In terms of a successful attempt to use the Internet against the structure of power, only the Zapatistas, whose use of the Internet is legendary, seem to have had some important impact.[42] There are, as yet, many fewer books, journals and magazines available electronically than would be needed for even the beginnings of the global digital library so often imagined.

Instead, the Internet has developed along a trajectory that better facilitates the accumulation of capital, despite potentials in the technology to function differently. Where the new technology possesses that kind of autonomy, it has been constrained within the limits of existing powers. In all likelihood, its autonomy is too limited for it to effectively alter the balance of social forces in the contemporary world. Social forces are so weighted towards capital that, without some large shift in that relationship, the Internet will remain primarily a tool of the powerful, and its use in challenging that power will remain marginal and ineffective. This does not imply that it cannot be used successfully in attempts to transform power relations, but that the success of such attempts should not be thought of as the automatic product of the power of the technology.

Conclusion Capitalist globalization is not the inevitable result of the latest technological developments. Capital has successfully appropriated these devices to such an extent that they are used most often to assist in the accumulation of capital, and so the technologies appear in forms that make that potential more evident than other potentials they possess. But the process of globalization, even in its latest neo-liberal phase, started long before use of the Internet became widespread. The acceleration of that process may have been facilitated by the use of advanced information technology, but it was also a product of many other factors.

In contrast to the image of these technologies as making necessary the triumph of neoliberalism, it is conceivable that the globalization of capitalism would have continued even had these technologies not been invented. It might have been more difficult to co-ordinate the transnationalization of

production and the global transfer of finance capital, and the process might not have come about so quickly, but these practices do not absolutely require those technologies.

Despite all these transformations in our world, most people still sell their labour power to someone who extracts surplus value from it, and the social order is still built on the relationship between those who own and those who work. What is new is the global scope of the market structure in which this activity takes place, but this is more a result of the social relations of economic activity, and the dynamic nature of capitalism, than of the inherent characteristics of the technologies being used in productive practices. This technology could be used in different ways, within a different set of social relations: there is nothing inherently capitalist about the new technologies, just as there is nothing inherently digital about global capitalism.

It does take some imagination, but one could envision a different kind of Internet, operating in a non-capitalist world. If computing resources could be controlled democratically, access to the technology would not depend on the ability to purchase the latest machinery, expensive high-speed access, and the latest software, and the Internet might take on very different appearances. Without the planned obsolescence of the competitive marketplace, considerably greater economies of scale could be achieved, lowering the purchase price of computers. With negligible copying costs, software could be distributed nearly for free, leading to much more equitable access to the benefits of the technology. More information could be made available on line, and public resources could be devoted to giving more people access to participation in decisions that affect their lives, and making available more of the creative cultural heritage of humanity to more people.

This is not likely to happen any time soon, but the important point is that alternatives to the way the technology is developed and implemented are possible. These are real possibilities, but they will not come about except as a result of struggle against the rush to privatize and commodify all information and communication. The ability to engage in such struggle may be limited at any given time, but it is not predetermined, despite the appearance of inevitability and naturalness of their own power that the powerful are able to

generate. Should such a struggle succeed, these different, non-capitalist potentials of the new technologies may be liberated and the pressures and limits on technological development could change.

By imagining ways to use and develop technologies that meet human goals rather than to facilitate the accumulation of capital, we can imagine different possible futures, thereby exposing the contingent character of that power and of the capitalist project of globalization. Allowing ourselves to believe that our technology can only be used to support the power of dominant groups in society is a tragic failure of the imagination which only reproduces that power by denying the possibility of challenging it.

Notes

1. One official example of this can be found in the 1995 report from Canada's Information Highway Advisory Council, titled "*The Challenge of the Information Highwa*y," which begins with the assumption that an information revolution is occurring, and proceeds by asking how rapidly Canada should be trying to develop the new technologies to take advantage of its potential, not by asking just what its potential is.

2. There are, of course, many different forms of technological determinism and critiques of it. For a good overview, see the essays in *Does Technology Make History?*, Leo Smith, (ed.), and Marx. Important arguments against this tendency have been made by Herbert Marcuse, *One Dimensional Man* (see Ch. 6) and Habermas, "Technology and Science as Ideology," and more recently by Feenberg, (1991). An earlier response is Lewis Mumford's discussion in *Technics and Civilization*. Also see the essays in *The Social Shaping of Technology*, Wajcman and MacKenzie, (eds.).

3. Martin Heidegger's *The Question Concerning Technology* adopts a deterministic approach to the issue; more recent examples include Jacques Ellul's *The Technological Society* (New York: Vinatge Books, 1964) and Langdon Winner's *Autonomous Technology* (Cambridge: MIT Press, 1977). Mary Shelley's *Frankenstein* is often cited as an example from classic literature; a more recent example might be the popular 1999 motion picture "Matrix."

4. McLuhan's work, particularly *The Gutenburg Galaxy* (Toronto: Unviersity of Toronto Press, 1962) and *Understanding Media* (Toronto: University of Toronto Press, 1964) is considered seminal by the publishers of WIRED magazine, the most popular source of discussions of cultural effects of the digital technologies. See also the works of Harold Innis, including *The Bias of Communication* (Toronto: University of Toronto Press, 1951) For a discussion of contemporary developments influenced by this perspective, see Ronald Deibert, *Parchment, Press and Hypermedia* (New York: Columbia University Press, 1998.)

5. A well-known example is G. A. Cohen, *Karl Marx's Theory of History: A Defence*. (New Jersey: Princeton University Press, 1980).

6. A Sivanandan, "Capitalism, Globalization, and Epochal Shifts: An Exchange" in *Monthly Review* 48/9 (1997), p. 20., citing Marx, *The Poverty of Philosophy* (New York: International Publishers, 1992) pp 80-81. The confusion over this sentence, which is most likely taken out of context more frequently than any other by Marx, is clarified particularly effectively by Harry Braverman, *Labour and Monopoly Capital*, (New York: Monthly Review Books, 1972.), pp 14-24.

7. Winner's argument, for example, is explicitly framed against the instrumentalist approach to technology which he saw, in the early 1970's, as the dominant position.

8. David Noble, for example, explains the capitalist goals behind automation in his *Progress Without People* (Toronto: Between the Lines, 1995.) Both Donald Gutstein in *e.con: How the Internet is Undermining Democracy* (Toronto: Stoddart Publishing 1999) and Dan Schiller in *Digital Capitalism* (Cambridge: MIT Press, 2000) analyse corporate influence over the Internet.

9. *The Information Age: Economy, Society and Culture*. Subsequent page references are to Volume I: *The Rise of the Network Society*, 2nd Edition, (Malden: Blackwell Publishers, 2000.); Volume II: *The Power of Identity* ((Malden: Blackwell Publishers, 1997); Volume III: *End of Millennium* (Malden: Blackwell Publishers, 1998.) The first volume has elicited comparisons with the classics of Marx and Weber. Castells' work has been described on the rear cover of the first volume by Anthony Giddens as "the most significant attempt to come to terms with" the subject matter, and by Krishan Kumar as "one of the great works of 'grand theory' of our time." The release of a second edition of the entire trilogy indicates the importance of the work in setting the trend for further developments.

10. The framework is described in Castells, Vol. I, pp 5 - 21. Also see Daniel Bell, *The Coming of Post-Industrial Society*, (New York: Basic Books, 1976), pp. 112-118. In essence, Castells has updated Bell's framework by including discussion of newer technologies and the displacement of the welfare state arrangements described by Bell with a neoliberal political economy.

11. The two terms don't mean precisely the same thing for the different authors. For Castells, the informational society makes use of computing technology's capacities to undermine the welfare state that was associated with industrial capitalism, whereas for Bell, the post-industrial society used computing technologies to process the information required to administer and regulate a welfare state. This divergence indicates that perhaps their implications are more open that either thinker realizes, but they both imply a new mode of development after industrial society.

12. See "The Network Enterprise" 1/3.

13. See Vol II, Chs 2 - 4 for his discussion of social movements, and Vol I, Chs 5 - 7 for his discussion of the changes in culture and the experience of time and space.

14. The conclusion of the trilogy admits as much, in a fashion that becomes essentially anti-intellectual; see Vol III, pp. 358-60, where he recommends that political interventions should not be informed by theory.

15. One might argue that the earlier change in the mode of development was only a shift from early agrarian capitalism to industrial capitalism,

and that the shift from feudalism to capitalism marked a different kind of shift, one in mode of production - but Castells doesn't explicitly state this. Or, he might hold that feudalism disappeared with the industrial revolution, or he might include feudalism in the category "statism." Without some reference to pre-capitalist production relations, his argument remains unclear.

16. Such a neglect in a work of such length might be surprising, except that (as is mentioned by other reviewers) he understands capitalism as a method of distribution of the surplus and not of production of goods.

17. Vol. I, p. 276.

18. Castells refers to the AOL-Time Warner merger, but does not consider it worth mentioning in his discussion of the network enterprise.

19. He discusses Cisco as an example of the "network enterprise" Vol I, pp 180-4.

20. See Naomi Klein, *No Logo* (Toronto: Stoddart, 2000), p. 255.

21. See Chris Benner, "Shock Absorbers in the Flexible Economy" (1996), a paper for Working Partnerships USA posted at http://www.atwork.org/temp/safe96.html.

22. That the important work of David Harvey is not discussed more by Castells is an indication of this problem. The Condition of PostModernity (Cambirdge: Blackwell Publishers, 1989) discusses the transformation of society much more convincingly. Castells borrows substantively from Harvey's discussion of the changing experience of time and place, but leaves out the equally important discussions of Fordism, modernity, and the enlightenment as a historical project.

23. Vol I, p. 46.

24. ICANN was created as the result of a White Paper issued by the US Department of Commerce, posted at http://www.icann.org/general/white-paper-05jun98.htm.

25. See ICANN's website, at http://www.icann.org/general/fact-sheet.htm.

26. For the report on this decision, see http://www.icann.org/general/ps-report-22mar00.htm.

27. The complete list of applications is posted at www.icann.org/tlds/tld-review-update-13oct00.htm

28. Scheeres, "Cuba Not So Libre With the Net," from the WIRED News service, posted at http://www.wirednews.com (23 February 2001).

29. Vol III, pp 7, 9.

30. Castells notes that control over technology reached as far as the direct oversight of the use of photocopying machines. Vol III, p. 36.

31. Vol I, p. 76. Castells refers to this as "Kranzenberg's law.

32. Vol I, p. 81.

33. Unfortunately, Williams' comments on technology are mostly derivative of his thinking on the question of the relation between economics and culture, and more work needs to be done to develop an adequate theory, before it can be applied to developments after his death. For the argument related to the relationship between culture and economy, see "Base and Superstructure in Marxist Cultural Theory" *New Left Review* 82, (1973) pp 3-16, or the book-length version, *Marxism and Literature* (Oxford: Oxford University Press, 1977) pp 75-89. For the argument related directly to technology, see *Television: Technology and Cultural Form* (Hanover: Wesleyan University Press, 1974), pp 123-128 or "Technology and Culture" in *Politics of Modernism* (London: Verso, 1982.)

34. Williams, *Marxism and Literature*, p. 84; Williams, *Television*, p. 124.

35. See, for instance, Febvre and Martin, *The Coming of the Book* (London: Verso, 1984.)

36. See Mark Mackinnon, "Pollution pact hailed as crucial first step," *Globe and Mail* (24 July 2001), p. A1.

37. Perhaps the best demonstration of this was Reagan's decision to launch the Strategic Defence Initiative, against the advice of the Office of Technology Assessment. See the original report by Ashton B. Carter, reproduced in Stephen E. Miller and Stephen van Evera, (eds.), *The Star Wars Controversy: An International Security Reader*, (Princeton Paperbacks, 1986), p. 253ff.

38. See Stephen Goddard, *Getting There: The Epic Struggle Between Road and Rail in the American Century*, which makes clear the political decisions involved in the choices around means of transportation.

39. Castells reviews the history of the Internet at pp. 352-5 of Vol 1.

40. "Bertelsmann joins with Napster," *Globe and Mail* (1 November 2000), p. B3.

41. This argument about the Tobin Tax proposal is made by, among others, Robert Chodos, Rae Murphy and Eric Hamovitch in *Lost in Cyberspace: Canada and the Information Revolution*, (Toronto: James Lorimer and Company, 1997), p 121.

42. For Castells, the Zapatistas are a perfect example of a social movement using new technologies to struggle against global informational capitalism; however, the novelty of their structure should not be overestimated. As Judith Adler Hellman points out, even distribution through email requires editorial work, and this means some level of central control over the messages. See "Real and Virtual Chiapas," *Socialist Register 2000*, pp 161-186.