Focus

Globalization from Below: Free Software and Alternatives to Neoliberalism

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ABSTRACT

This article explores one of the central struggles over the politics of globalization: forging alternatives to neoliberalism by developing new forms of globalization from below. It focuses on a unique facet of this struggle, rooted in the centrality of information technologies for global trade and production, as well as new forms of media and digital culture. The analysis has four main parts: examining the key role of software as a technological infrastructure for diverse forms of globalization; conceptualizing the contradictory implications of three software business models for realizing the utopian potential of digital technology to develop forms of globalization from below; exploring how three free and open source software business models were put into practice by Red Hat, IBM and the Free Software Foundation; and analysing Brazilian software policy as a form of globalization from below that challenges the historical dominance of the global North and seeks to develop new forms of digital inclusion and digital culture.

INTRODUCTION

Since the 1990s, globalization has become 'the new grand narrative of the social sciences' (Hirst and Thompson, 1999: xiii). Indeed, the discourse of globalization has spread beyond the academy, converging with neoliberal economic policy to shape what George H.W. Bush called the 'new world order'. Globalization is a multidimensional set of economic, political and cultural conditions constructed in the context of technological change and discursive narratives of power and knowledge (Schoonmaker, 2002). It spans the increasing internationalization of production; political struggles over the conditions for living in a world where social life is increasingly constructed by a hybridized blend of local and global forces; and changing forms of local and global culture.

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Contemporary forms of globalization are rooted in the historical development of capitalism as a world system shaped by processes of technological change, particularly in the information and communications fields. Communications and information technologies have facilitated the global integration of international markets since the first use of underwater transoceanic cables in the nineteenth century (Hirst and Thompson, 1999; Schoonmaker, 2002). Former colonial powers from the global North have engaged in economic, political and cultural relationships with the global South for hundreds of years, culminating in a neoliberal model of globalization that became dominant in the 1980s.

By that time, a development policy consensus had arisen that neoliberal measures such as privatizing state companies and eliminating trade restrictions were the best approach to development, especially in the global South (Haggard and Kaufman, 1992; Stallings, 1992). The global North supported the interests of transnational corporations in opening markets around the world to global capital. In the global South, a diverse range of governments and grassroots community groups attempted to resist neoliberalism by retaining greater control over economic development at the national and community levels. They struggled against the neoliberal model of globalization that made national development plans subservient to global capital and international institutions like the World Bank and the International Monetary Fund (McMichael, 2000); they fought for a different form of 'globalization from below', where 'marginalized individuals and social movements resist globalization and/or use its institutions and instruments to further democratization and social justice' (Kellner, 2002: 293).

One of the key political struggles of our time is thus the attempt to forge alternatives to neoliberalism by developing new forms of globalization from below. This article explores one particular facet of this struggle which is evolving around information technologies. This is of particular significance, given the major role that information technologies play in global trade and production, as well as their potential to provide new forms of media and digital culture. The paper is divided into four main sections. It first analyses the key role of software as a technological infrastructure for diverse forms of globalization; it then conceptualizes the contradictory implications of three software business models for realizing the utopian potential of digital technology to develop forms of globalization from below, as well as for reinforcing the hegemony of capital. The third section examines how three free and open source software business models were put into practice by Red Hat, IBM and the Free Software Foundation, while the final section analyses Brazilian software policy as a form of globalization from below which challenges the historical dominance of the global North and seeks to develop new forms of digital inclusion and digital culture.

INFORMATION TECHNOLOGY AND PROSPECTS FOR GLOBALIZATION FROM BELOW

From the 1970s until 1990, and again in the twenty-first century, the Brazilian government was a key actor in efforts to forge an alternative to the neoliberal form of globalization. Since the Internet and global computer networks provided a 'technological infrastructure for the global economy' (Kellner, 2002: 287), information technology sectors have been a major focus for these conflicts over the politics of globalization. Computer manufacturing and software industries are central to virtually all production processes in the global economy, due to their role in this technological infrastructure. In the 1970s, Latin American and African nations feared the development of a new form of technological dependency rooted in their lack of technologies, skills, industries and communications infrastructures in these cutting edge industries. They held a series of meetings calling for a New World Information Order to combat global inequalities in the development of information technology and the prospect of increased technological dependency (Murphy, 1986; Smith, 1980).

The Brazilian government was one of the few in the global South with the economic resources and political will to implement a major information technology policy. In the 1970s and 1980s, it engaged in an informatics strategy to foster the growth of national computer firms and limit foreign investment in those markets (Evans, 1986). Since 2003, it has promoted the shift from proprietary to free and open source software in government agencies. This was a fresh way to pursue longstanding goals of promoting national technological development and resisting domination by the global North in key information technology sectors. The Brazilian government also pursued new goals of digital inclusion, seeking to expand access to information technologies and to educate historically disenfranchised groups in how to use them. These struggles addressed what Kellner (2002: 291) called the 'objective ambiguity' of globalization, that 'simultaneously creates friends and enemies, wealth and poverty, and growing divisions between the "haves" and "have-nots"'.

The software sector presented unique opportunities to forge alternatives to neoliberalism that combated existing global inequalities and created new forms of globalization from below. Its digital form made it technically possible to transform programmes if software producers provided access to the source code. This allowed communities to adapt programmes to suit their needs and to gain fuller control over their use of information technology. It strengthened the democratizing potential of the Internet and the World Wide Web as a digital form of the commons. Shiva (2001: 47–8) provided a vision of the commons as 'resources shaped, managed and utilized through community control. In the commons, no one can be excluded. The commons cannot be monopolized by the economically powerful citizen or corporation or by the politically powerful state'. Creating a digital commons involved a

struggle for digital inclusion such as the one begun in Brazil and discussed further below.

Since the 1960s, computer programmers, corporations, governments and consumers have engaged in a multifaceted process to create software systems in the context of capitalist markets. They developed three major models for doing business in the software market that shaped their interests in constructing software systems, as well as the market itself, in particular ways. First, the proprietary model advocated legal restrictions on the ways that software users could access and transform software programmes. The major underlying motivation for the proprietary model was to maximize corporate profits from software by selling it as intellectual property. This fitted with the logic of the dominant neoliberal form of globalization, which was rooted in the power of capital to enter markets around the world under whatever conditions were most profitable. Second, the free and open source software model emphasized collaboration between software programmers and users by providing access to the programmes' source code. Firms could profit by selling free and open source software; however, these activities simultaneously contributed to the development of a digital form of the commons. Finally, a dual business model combined proprietary with open source software to allow corporations to engage in both forms of software development and sales. In the following section, I explore how these three models embodied the 'utopian potential in the new technologies, as well as the possibility for increased domination and the hegemony of capital' (Kellner, 2002: 301). The utopian potential to create a digital commons as a form of globalization from below largely conflicted with corporate efforts to profit in the software market. Interestingly, however, there were unexpected connections between these two possible trajectories for software development.

CONSTRUCTING THE SOFTWARE MARKET: UTOPIAN POTENTIAL VS. HEGEMONY OF CAPITAL

The beginnings of an open source software model arose unintentionally through the activities of major computer manufacturers in the 1960s. At that time, the computer business involved selling mainframes to corporate customers with large data processing needs, such as banks and insurance companies. Computer manufacturers like IBM, Rand, Burroughs and Data General each set up the interaction between the hardware and software elements of their systems differently. Software programmes were thus designed to run on particular machines and were not compatible with other brands. Computer manufacturers did not seek to control their software, since it would not be usable on other systems. Software was often not even compatible with machines of different series made by the same firm.

A major technological breakthrough occurred in 1964 when IBM developed the System/360 computer architecture that made it possible to run the

same software on successive series of IBM machines. IBM promoted this advance in interoperability by giving away its operating system, making the source code available to all users who requested it and encouraging users to copy or make changes to it to suit their needs. IBM did not refer to this as a free and open source business model; however, its mode of operations did fit the spirit of that model as it was developed in later decades. In 1966, the Vice President of IBM promoted what amounted to an open source approach in his effort to develop political conditions favouring the spread of this new software programme. As a member of the President's Commission on the Patent System, he argued that software should not be governed by patents (Drahos and Braithwaite, 2002). In the process, he promoted the creation of market conditions conducive to free and open source software, while opposing a proprietary model.

In the market conditions of the 1960s, programmers thus had free access to the source codes of software programmes and could make any changes they saw fit to improve the programmes or adapt them to their needs. Computer manufacturers like IBM 'encouraged their customers to form free software sharing organizations . . . helping to create a bigger community of software developers . . . that would in a few decades give (not sell) the world the Internet' (Drahos and Braithwaite, 2002: 170). As Lessig (2004) points out, those programmers enjoyed the kinds of academic freedoms shared by scholars in university settings today, where people critique and build upon each other's work to contribute to the development of knowledge in the field. At MIT's Artificial Intelligence Laboratory, programmers first began to identify themselves as 'hackers' and to develop a hacker culture that prized programming skills and the collaborative work required to write the code for increasingly complex software.

Hacker influence spread exponentially after 1969 in the wake of another technological breakthrough. The US Defense Department developed the ARPAnet, the first transcontinental, high-speed computer network. Originally planned as an experiment in digital communications, the ARPAnet eventually expanded to connect hundreds of defence contractors, universities and research laboratories. The ARPAnet 'enabled researchers everywhere to exchange information with unprecedented speed and flexibility, giving a huge boost to collaborative work and tremendously increasing both the pace and intensity of technological advance' (Raymond, 1999: 20). It embodied the utopian potential for globalization from below, while simultaneously providing the communications infrastructure to facilitate corporate activities on a global scale.

The hackers were key actors in this process of transformation, since they were uniquely positioned to continue to foment and build upon the technological changes underlying software and emerging digital communications. Raymond (ibid.) notes that the ARPAnet's 'electronic highways brought together hackers all over the U.S. in a crucial mass; instead of remaining in isolated small groups each developing their own ephemeral local cultures,

they discovered (or reinvented) themselves as a networked tribe'. During this period, hackers invented the Unix operating system and the C computer language, designed to be simple, flexible, and as portable as possible, so that they 'could carry around software toolkits between different machines, rather than having to re-invent the equivalents of fire and the wheel every time' (ibid.: 23). By 1980, the use of C and Unix spread from AT&T to various universities and other research facilities (Raymond, 1999).

The development of the ARPAnet, C and Unix thus fostered the hacker ethic of collaboration; in the process, they increased communication among hackers and broadened access to software programmes during the 1970s. In the late 1970s, however, conditions changed markedly. Demand for software soared and a range of computer manufacturers produced hardware compatible with IBM systems. IBM responded to these developments by shifting its software business model from the open source to the proprietary, by attaching copyright notices to IBM software starting in 1978. In 1983, IBM stopped providing access to the source code for its software, and began limiting the transfer of other technical information. As Drahos and Braithwaite (2002: 171) argue, '[h]aving set the industry standard through its dominance, IBM now wanted to use copyright to exclude others from competing under the standard'.

With the technological development of software programmes that could be imported between computing systems, a market incentive was created to hide the source codes of programmes and copyright them. These changes thus marked a shift toward corporate struggles to assert the hegemony of capital and transform the utopian vision of software as a shared community. As IBM led the fight to extend copyright law to software during the 1980s, companies like Microsoft joined the struggle as well. Corporate interests thus coalesced around the proprietary business model for the software sector to protect their investments in software programmes as lucrative new sources of revenue (Drahos and Braithwaite, 2002; Lessig, 2004). This proprietary model required the construction of political and economic conditions in the software market that defined software as intellectual property and allowed firms maximum leeway to buy and sell that property. At the same time, however, solidifying the proprietary software model threatened the freedoms that the hackers had previously enjoyed. As Lessig (2004: 280) observed, '[t]he world of free software had been erased by a change in the economics of computing'.

The construction of a proprietary software market had broad social implications that were felt most immediately by the hackers themselves, radically altering the conditions under which they did their programming work. The hackers responded by seeking to create a new set of conditions to support the practice of the hacker ethic that viewed software as a collective resource, a form of commons that should be shared with others who could both benefit from it and contribute to its further development. In 1984, Richard Stallman, a hacker at MIT's Artificial Intelligence Laboratory, initiated a project to

create a free software system compatible with Unix. He called it the GNU Project, which stands for Gnu's Not Unix, and resigned from his job at MIT so that his employer would have no legal grounds to require him to sell GNU as proprietary software (Gay, 2002).

At the political and ethical levels, Stallman contributed to the development of an alternative to the proprietary software model by creating an organization through which hackers could come together to articulate and potentially advance their interests. He founded the Free Software Foundation (FSF) in 1985. According to its webpage, FSF is 'dedicated to promoting computer users' right to use, study, copy, modify, and redistribute computer programs. . . . The FSF also helps to spread awareness of the ethical and political issues of freedom in the use of software'.[1] These issues are rooted in four types of freedom for software users, which involve protecting the liberty of software users as a community. Stallman states that '"free software" is a matter of liberty, not price. To understand the concept, you should think of "free" as in "free speech", not as in "free beer"' (quoted in Gay, 2002: 41). The four kinds of freedom include the freedom to run the programme for any purpose; to study the programme and adapt it to the user's particular needs; to redistribute copies of the software 'so you can help your neighbor' (ibid.); and the freedom to make improvements in the programme and release them for the benefit of the entire software community. The four freedoms require access to the source code so that users can make changes to the programme.

Stallman engaged in legal action to promote political and economic conditions for the continued development and use of free and open source software. These conditions made it possible for the latter model to coexist with the proprietary model and to develop as a form of globalization from below, even though the proprietary model continued to be dominant. In 1989, Stallman used copyright law to create a legal construct to ensure that the four freedoms would be protected, by copyrighting the GNU General Public License (GNU GPL). All software under the GNU GPL was copyrighted under existing copyright law. At the same time, however, the licence undermined the usual proprietary restrictions of copyright law through what Coleman (2004: 515) called a 'clever legal hack'. 'Copyleft' required that software licensed under the GNU GPL include the source code so that any future user would be able to modify the programme. Copyleft thus used the legal protection established by copyright law to subvert the fundamental logic of that law, requiring users to participate in the fundamental freedom to access source code, make changes to the programme, and allow others to do the same. The founder of one of the leading open-source software firms, Red Hat Software, described the GPL as 'the most effective license for ensuring that this forced cooperation among the various team members continues to

1. See the FSF webpage at http://www.fsf.org.

occur regardless of the competitive environment at the time' (Young, 1999: 121).

In spite of its success in establishing 'forced co-operation' with the GPL, the Free Software Foundation encountered major problems over several years in its effort to develop a Unix kernel and to realize the utopian potential of digital technology more fully. In 1991, a Helsinki University student named Linus Torvalds used FSF's toolkit to overcome these problems by initiating the development of Linux, a free Unix kernel. Raymond (1999) describes the unique social relations involved in the process of developing Linux. Instead of following the traditional model of using a small, tightly co-ordinated group to develop an operating system, Linux was 'rather casually hacked on by huge numbers of volunteers coordinating only through the Internet. Quality was maintained not by rigid standards or autocracy but by the naively simple strategy of releasing every week and getting feedback from hundreds of users within days, creating a sort of rapid Darwinian selection on the mutations introduced by developers' (ibid.: 28). The result of this intensely collaborative, flexibly organized process was Linux — a 'full-featured Unix with entirely free and redistributable sources' (ibid.: 27).

Over the course of the 1990s, hackers contributed to the further development of the free and open source model, which increasingly coexisted with the proprietary model in the markets for software and Internet use. They concentrated their work on continuing the development of Linux, as well as launching Internet Service Providers to provide increased public access to the Internet. In 1989, Tim Berners-Lee invented the World Wide Web (WWW), a system for browsing Internet sites to allow global information sharing (Raymond, 1999). Comprised of many Internet sites linked together so that users can travel between them by clicking on hyperlinks, Berners-Lee defined the Web as 'the universe of network-accessible information, an embodiment of human knowledge'. In a similar vein, Castells (1996: 355) called the Web 'a flexible network of networks . . . of individualized, interactive communication' within the Internet.

Free and open source software advocates thus created a form of globalization from below, an alternative to the dominance of global capital over information technology as the technological infrastructure for globalization. Hackers contributed to the development of this infrastructure by using the market and the legal system in alternative ways. They promoted the development of a digital commons and drew upon the utopian potential of digital technology as easily shared and created within a highly diverse global community. Free and open source software companies could make money selling software; however, they did not function according to an economic model by which they owned or sold software as intellectual property. Their business activities thus contributed to the digital commons as a shared resource, rather than to the proprietary software model that restricted access to the commons and reinforced the power of global capital. By contrast, IBM's involvement with open source software development had contradictory

effects with respect to developing the digital commons. Since its focus was maximizing corporate profits, it invested in open source as a strategy to support its profit making operations, complicating its contribution to building the digital commons.

IMPLICATIONS FOR DEVELOPING THE DIGITAL COMMONS: RED HAT, IBM AND FSF

Efforts to create new forms of the commons resonated with what Held (2004: 163) called the 'project of global social democracy — the basis of a new global covenant' to integrate cosmopolitan values of the moral and political equality of all human beings into political, economic and social institutions. Developing global social democracy would involve a wide range of transformations, including 'a deeper commitment to social justice; the protection and reinvention of community at diverse levels; and the transformation of the global economy into a free and fair rule-based economic order' (ibid.).

The development of a digital commons was a key part of this ambitious project of global social democracy, involving 'building new institutions for providing global public goods' (ibid.: 168). The Free Software Foundation was one such institution that participated in this 'protection and reinvention of community'. As outlined above, the users and creators of free and open source software were complex, diverse and loosely structured (and in some ways, largely unstructured). Free and open source software was continually evolving through the actions of individual hackers, hacker communities, government policies and business practices in many countries around the world. This section explores three approaches to free and open source software, each of which is based upon a different relationship to the software market and has distinct implications for developing a digital commons as an alternative form of globalization from below.

The Red Hat 'Open Source' Model: Developing the Market for Free and Open Source Software

One way to develop the digital commons was to foster the market for free and open source software, contributing to the development of the software itself as well as expanding the users of that software by building a customer base. The market thus provided a means to expand the digital commons as a global public good, as well as a venue for business opportunities.

Robert Young, the founder of Red Hat Software, provided an example of this alternative approach to the market. He identified the challenge for open source firms as developing more users of free and open source software, in the context of a market dominated by proprietary software. This challenge

was considerable, considering that Microsoft's Windows operating system was used on over 90 per cent of the world's personal computers (Pillar, 2006).Young sought to address this situation by expanding the size of the market for free and open source software as a whole, since more users of such software would potentially create more customers for Red Hat. He argued that you 'can't compete with a monopoly by playing the game by the monopolist's rules. The monopolist has the resources, the distribution channels, the R&D resources, in short, they just have too many strengths. You compete . . . by changing the rules of the game into a set that favors your strengths' (Young, 1999: 118). Young thus highlighted the need for his firm to approach the software market in a new way. He understood the expansion of the general market as in the interest of his company, rather than viewing all other software firms, and particularly free and open source firms, as competitors with conflicting interests.

Based upon the nature of open source software as providing source code so users can continually modify it to suit their needs, Young and his colleagues sought to develop a unique software business model by looking at 'industries where the participants benefit because of, not despite, the activities of the other participants' (ibid.: 116). They explored models from the legal industry, where winning arguments become public domain rather than being patented to restrict their use. They learned from the auto industry, based upon assembly and service using a collection of many different parts available to the industry as a whole. They adapted ideas from the commodity industry, where companies became successful by building brands that symbolized high quality and reliability to their customers. In the process, they fostered an ongoing process of innovations that 'accrue to the community at large' (ibid.: 125).

IBM's Dual Strategy: Open Source as a Resource for Profit

By 1998, IBM recognized the potential of this community to offer strategic advantages for its corporate operations. Seeking to extend its activities into profitable new markets, IBM was impressed with the quality of open source software and with the programmers engaged in its development. Members of IBM's Research Division and Software Group noted that 'the overlap between developers and users of a particular OSS project made possible excellent and open communication, rapid development cycles, and intensive real-environment testing, ultimately producing software that was often very good and sometimes excellent by our standards' (Capek et al., 2005: 250). In 1999, IBM developed a dual software strategy; it retained separate proprietary software activities and complemented them with open source as an alternative business model with distinct benefits.

IBM's engagement with open source reflected globalization's 'contradictory mixture of democratizing and antidemocratizing tendencies' (Kellner,

2002: 292). On the one hand, IBM contributed to open source software development that might be part of the democratizing project of developing a digital commons. Indeed, in 2001, IBM announced plans to invest US$ 1 billion in Linux over a three-year period. On the other hand, IBM only funded systems that supported its proprietary activities, such as middleware software programmes for corporate clients. These programmes benefited from high quality open source infrastructure systems. For example, IBM's WebSphere Application Server uses the Apache HTTP (HyperText Transfer Protocol) (Capek et al., 2005).

This dual software strategy had complicated implications for developing a digital commons. To protect its overarching goal of maximizing profits, IBM avoided using certain patents in its open-source work to retain exclusive rights over those systems (ibid.). The potential for IBM to contribute to the digital commons was thus consistently undermined by its efforts to position itself most effectively in the proprietary software market. Indeed, Stallman called systems that mixed open source and proprietary software 'freedom subtracted products' (Gay, 2002: 22). From his perspective, any software system that included proprietary elements detracted from the collaborative project of building a software-sharing community. When software developers wrote programmes that depended on the non-free part of such a system, their work became tied into the proprietary system and could not be integrated into completely free software (Gay, 2002).

The Free Software Model: Struggling to Create a Software-Sharing Community

The FSF offered a third strategy that conflicted with the open source and dual models, which failed to provide 'a social advantage, allowing users to cooperate, and an ethical advantage, respecting the user's freedom' (Gay, 2002: 22). FSF's vision of a software-sharing community arose from and was shaped by the USA cultural context emphasizing values of individual choice and creativity.

Coombe and Herman (2004: 569) viewed FSF as part of a 'digital counterculture' that tended to emphasize the rights and activities of 'individuals — independent authors and cultural creators projected (but never acknowledged) as privileged Americans with indisputable First Amendment freedoms' (ibid.: 569–70). In a similar vein, Chan depicted Stallman as critiquing Latin American government strategies to promote the use of free software. She quoted his statement describing such laws as 'not the kind of help we most ask for from governments . . . What we ask is that they not interfere with us with things like the Digital Millennium Copyright Act, with software patents, with prohibitions on reverse engineering that enable companies like Microsoft to make proprietary data formats and prohibit our work' (Chan, 2004: 543). She thus underscored Stallman's emphasis on the freedoms of individual users and creators as distinct from Latin American government

concerns with promoting national sovereignty through the development of digital culture and literacy.

While Stallman and the FSF did emphasize individualism, the values of community and co-operation also played a central role in Stallman's work. In his 1994 essay, 'Why Software Should Not Have Owners', Stallman grounded his entire concept of free software in a theory of society as needing 'information that is truly available to its citizens — for example, programs that people can read, fix, adapt and improve, not just operate . . . Society also needs freedom. When a program has an owner, the users lose freedom to control part of their own lives. And above all society needs to encourage the spirit of voluntary cooperation in its citizens' (Gay, 2002: 47–8). Individual freedom was thus understood within a social context, as part of a broader societal value that promoted co-operation among citizens in producing and using information.

Equally important in the context of globalization, Stallman understood that promoting the ethic of freedom affects struggles for technological and economic development by countries in the global South. He emphasized these struggles in a 2001 speech to the Brazilian Congress, where he described free software as

> a political and ethical issue, just like freedom of the press or freedom of association. . . . It makes sense, especially for countries like Brazil that are not rich, to encourage the country to switch from proprietary software to free software. . . . In addition to giving people freedoms, software has a secondary benefit because people can use this freedom to save a lot of money now draining away to a few rich foreigners (Stallman, quoted in Festa, 2001).

Stallman's words struck a chord in the Brazilian context. As already mentioned, Brazil has historically used government policy to foster the development of computer manufacturing and software industries, as part of a larger effort to promote national sovereignty and resist economic domination by the global North. In 1976, the informatics policy established the 'market reserve' to protect the Brazilian computer market as part of the national patrimony, a public good to be 'reserved' from foreign investment in mini and personal computers. In 1984, the National Informatics Law extended the market reserve for eight more years, adding further limitations on imports and the acquisition of foreign technologies to promote local development of technology and scientific knowledge in the information technology field (Evans, 1986). The informatics policy was designed to give local firms the chance to grow in these industries by protecting them from foreign competition for a specific period of time, thus fostering technological autonomy and resisting a new form of dependency in this cutting edge sector of the global economy. In 1985, this strategy sparked conflicts with the Reagan administration on the grounds that it placed 'unfair' limits on trade and investment by US corporations. Starting in 1990, the policy was dismantled under a complex combination of national and international pressures to shift toward a

neoliberal regime that opened Brazilian markets to global capital (Schoonmaker, 2002).

In the early twenty-first century, Brazilian engagement with the process of informatics development took a new turn with the election of Luiz Inácio Lula da Silva as President. Since taking office in 2003, Lula has supported the use of free and open source software as part of a broader emphasis on digital culture and technological autonomy. His software policy provides further insights into the prospects of developing an alternative form of globalization from below. Brazil's current and former software strategies were designed to resist the dominance of global capital by promoting the growth of Brazilian firms. Such alternatives rooted in the development of national capital have limited potential to contribute to the growth of a digital commons, but Brazilian efforts to foster digital inclusion are more promising in that regard.

BRAZILIAN SOFTWARE POLICY: PROSPECTS FOR ALTERNATIVES TO NEOLIBERAL GLOBALIZATION

Lula viewed free and open source software as promoting technological autonomy through the development of local knowledge, skills and systems in the software field. In October 2003, Lula announced his decision to shift from proprietary to free and open source software in government agencies. Brazil's National Institute of Information Technology (ITI) was the agency in charge of co-ordinating these changes in Brazil's large and heterogeneous government sector. Sérgio Amadeu da Silveira, then president of ITI, described the Lula administration's software strategy as designed to position Brazil as a 'producer of solutions and not a mere consumer of alternatives produced by other countries', and highlighted the importance of the strategy as 'a change of paradigms' in the ways software was produced and used (quoted in Carrasco, 2007). These broader goals of using software policy as a tool to shift Brazil's place in the international division of labour, strengthening its position as a producer of technology and as an actor to be reckoned with in the politics of global trade and development, build upon the legacy of the informatics policy. These goals are the hallmark of Brazilian software policy as an alternative to neoliberal globalization, which operates according to the proprietary model and seeks to open markets around the world to global capital.

Amadeu emphasized the problems of the neoliberal, proprietary software model for Brazil. Noting that Brazil paid US$ 1.1 billion in software licensing fees in 2002, he called the debate over free and open source software a 'war of technological points of view', naming China and India as Brazil's allies in the struggle for liberation from 'the market reserve of proprietary software' (quoted in Marques, 2005). Amadeu criticized the constraints created by Microsoft's dominance of the proprietary software market by alluding

to struggles during the 1980s, when Microsoft and the US government opposed Brazil's market reserve policy. In the historical context of the Brazilian informatics policy, Amadeu's remarks implied that years after the market reserve was dismantled in the transition to neoliberal reforms, it was Microsoft and other proprietary software companies that were restricting entrance into the software market by implicitly 'reserving' it for themselves.

Microsoft does indeed dominate the proprietary software market in Brazil: 60 per cent of servers in Brazilian firms use its Windows programme, according to a study by Brazil's Gétulio Vargas Foundation (Marques, 2005). Microsoft thus has the most to lose with the rising interest in free and open source systems in Brazil. In 2001 a Microsoft spokesperson responded to these changes by referring to free and open source software as 'a cancer, an intellectual property destroyer' and 'un-American' (quoted in Festa, 2001).

Ricardo Adame, another spokesman for Microsoft, reacted to Lula's decision to shift to free and open source software by saying, 'we don't believe that governments should pick winners and losers . . . Technology should compete on its merits in a free market. Let the government look at all the options and then make a decision' (ibid.). Adame noted that while the Brazilian government was considering making the use of free and open source systems a requirement, Microsoft had lobbied against this practice through regional trade associations, as well as discussing their views with Brazilian government officials. Microsoft urged the Brazilian government to base its decisions about technology acquisition 'on the benefits and value of that technology and not on limiting those possibilities' (ibid.). Microsoft thus defended the proprietary software business model against Brazilian government interest in pursuing a mix of free, open source and proprietary systems.

Brazil is not alone in its efforts to craft alternatives to the proprietary model in software, and thus contribute to the broader process of creating alternatives to the dominance of the global North in neoliberal globalization. Renato Martini, current President of ITI, notes that the use of free and open source software 'is under debate throughout the world, there is no going back. . . . The Northern Hemisphere is not going to give anything to us, we have to be creative in order not to be left behind' (quoted in Reggiani, 2006). At this point in time, Brazilian 'creativity' involves implementing a transition to free and open source systems in a range of government agencies. For example, since late 2003, the large federal government data processing services company, Serpro, has been implementing a programme to shift to open source systems. As a result, 3,700 (or 75 per cent) of all the PCs used for administrative work run on the open source software system OpenOffice.org and use the Firefox Internet browser. The importance of these changes was underscored by Deivi Lopes Kuhn, the co-ordinator of the transition to open source software: 'Serpro had gone ten years without investment, we were scrapped, technologically dephased. With free software, we were able to keep pace with the evolution of technology and make better use of our budget' (quoted in Reggiani, 2006). In 2004, Serpro was able to redirect money saved

on licensing into training, consulting and technical support, as well as buying new equipment.

Serpro's experience with the transition to open source software provides a useful resource for other government agencies undergoing similar changes, such as the military. At the end of 2005, the military completed the first stage of its transition, with 60 per cent of its machines running on open source software. The full military project will eventually involve transitioning to open source systems for 2,500 servers and 30,000 desktop computers in more than 700 units throughout Brazil. Almost 1,000 military technicians are involved in this transition project, which aims to reach 98 per cent of information technology users. The military has also begun to take advantage of the open source systems to develop its own strategic software applications (Reggiani, 2006).

The development of free and open source software has been encouraged throughout Brazilian government agencies. Technicians in the Ministry of Education developed a software programme for distance learning and made the source code available for anyone to use. ITI created and made available a group of Internet security programmes. The Dataprev agency developed a network diagnostic programme to identify the most common problems faced by Internet users. At the state level, the Companhia do Metropolitano de São Paulo-Metro is a company with majority ownership by the state of São Paulo in partnership with private investors. Since 1997, it has shifted to the use of free software by changing from Microsoft Office to StarOffice and eventually to OpenOffice.org, Firefox and other open source programmes (Reggiani, 2006).

Such activities promote the development of software as a public good, a digital commons created by a software-sharing community where programmers exchange ideas and work to solve collective problems. ITI is encouraging this process by developing a legal definition for a software licence for unrestricted use that obligates the user to share any changes made to the original programme. Such a licence would ensure that software would remain free and guarantee that the original source code would not become proprietary. It would thus be similar to the GNU GPL, as well as to the licence for the Linux kernel that has been combined with GNU in the Linux/GNU system and with proprietary software in many open source systems (Reggiani, 2006).

The growth of software as a public good extends beyond the government sector in Brazil. A number of private Brazilian companies have made substantial shifts to open source software systems over the past several years. A Yankee Group study of 200 of the largest private Brazilian companies showed that 14 per cent planned to change to Linux in 2005. Major retail firms like Carrefour and Lojas Renner, banks like HSBC and ABN Amro, and the telephone company GVT are already using open source software due to its ability to help save costs, and improve performance and security (Marques, 2005).

In the case of Carrefour, the shift to open source software was initiated by testing Linux for several months in 100 cash registers, in order to study the systems and analyse their performance. This allowed Carrefour to develop a plan to make the transition to open source software for the 7,000 cash registers throughout the entire supermarket chain. André de Souza, Carrefour's manager of information technology, highlighted the advantages of Linux software for increasing speed and stability; operations that took three minutes using proprietary systems could be done in thirty seconds with Linux. A less quantifiable, but more important, advantage of Linux is the ability to become independent from proprietary software companies by developing software applications to fit their particular needs (Marques, 2005).

Another major Brazilian retailer, Lojas Renner, has also shifted many of its operations to Linux. Sixty of its eighty servers run on Linux, with plans to shift the rest to Linux as they age. Renner's general manager of technology, Luiz Agnelo Franciosi, noted that the Linux option 'is for the best, independent of cost' (quoted in Marques, 2005). Similar changes are underway in major transnational computer manufacturers like IBM and Hewlett Packard that run Linux on most of their systems. The manager of Linux technologies for IBM Brasil, Tarcisio Lopes, described the rising reliance on Linux as a 'model of development and distribution of free software [that] is an irreversible fact, a force that nobody can ignore' (quoted in Marques, 2005).

In Brazil, this shift from proprietary to open source systems contributes to larger development goals. Ricardo Bimbo, co-ordinator of the plan to transfer from proprietary to free and open source software in the government sector, highlighted these goals in his discussion of the main reasons for changing to open source (Osava, 2005). First, macroeconomic conditions involving the high cost of software licensing led to increased payments for royalties and licensing fees on imported software in Brazil from US$ 600 million in 1999 to US$ 1.1 billion in 2002. Such costs make it difficult to achieve goals of digital inclusion through programmes such as integrating twenty computers into each of the country's 100,000 schools. Second, the Brazilian government, and particularly the military, is concerned about threats to national security involved when users lack access to programming codes and thus have more difficulty protecting their systems from viruses and from people who would break into the systems. Third, the shift to open source software is viewed as a way to promote technological autonomy and independence from foreign economic influence. The government argues that the lack of access to the source codes for software systems makes it vulnerable to fraud in its dealings with foreign corporations. For example, the Brazilian Ministry of Labour refused to pay part of the US$ 30 million fees in their annual contract with the transnational computer firm Unisys, alleging that Unisys used its control over the official data banks to levy unjustifiable charges. Open source software would allow Brazilian software users to access the codes and monitor such dealings more closely (Osava, 2005).

As in earlier decades under the informatics strategy, the Brazilian government thus views information technology policy as a way to promote technological autonomy and industrial development in this crucial sector of the global economy. The Lula administration seeks to pursue these longstanding development goals in fresh ways through free and open source software policy. As discussed above, the use of open source systems that include proprietary elements undermines broader efforts to create alternatives to neoliberal globalization by developing a digital commons. In the Brazilian case, the implications of combining open source and proprietary software are complicated. Despite its drawbacks, the strategy nevertheless promotes the development of local capital and undermines domination by the global North, and therefore offers an alternative to neoliberal globalization. The benefits of this alternative are limited, however, since they accrue to national capital and thus may not contribute to broader processes of democratization and social justice within Brazil. Hence, this alternative is significant in the context of power relations between North and South, but not at the level of community, grassroots participation of marginalized social groups within Brazil.

The Lula administration's software strategy has a fourth goal, however, which addresses this level of community participation (Osava, 2005). It has the potential to contribute to the development of a digital commons and to more grassroots forms of democratization and social justice. It extends beyond the earlier informatics strategy focus on implementing information technology in industry, government, and even education, into the broader realms of cultural and social life. Lula chose Gilberto Gil, one of the leaders of the *tropicalismo* music movement who critiqued dictatorship through his art during Brazil's history of military rule, to implement this goal through his work as Minister of Culture.

Gil is a vocal advocate of free software as part of a broader cultural policy to deepen processes of democratization and resistance to entrenched class and racial inequality. In a speech at New York University, he describes this policy as 'anti-authoritarian, anti-bureaucratising, anti-centralising, and . . . profoundly democratic and transformative' (Gil, 2005). Brazil's cultural policy takes the Internet as 'a paradigm to be pursued in the understanding of digital culture; broadband as a public policy to be implemented, and, ultimately, interactivity as a necessary condition for all cultural activities' (ibid.). Gil thus champions an approach to cultural policy that views digital reality as inclusive and globalized, so that 'the centre of the world is no longer geographical' (ibid.). Such an approach understands and responds to the fractured, complex nature of reality as full of the 'imponderable, of surprises . . . things that are often intangible, often impossible to plan, yet fundamental' (ibid.).

Gil outlined the major themes of his approach to free software and cultural policy in a speech at the University of São Paulo (Gil, 2004). In the Brazilian

context, Gil views free software as central to 'collective sovereignty . . . a cultural question par excellence' that fits with his mission to promote cultural diversity and social equality. Free software contributes to these goals by promoting skills and knowledge for historically disenfranchised Brazilians to participate in what Gil calls 'creative and clean' industries such as music, design, publishing, software, photography and various other forms of cultural production (ibid.). He argues that for Brazil and other countries in the global South, such industries represent 'the heart of their chances of success in globalization' (ibid.). He advocates creating jobs in these sectors, which were projected to have a global market value of over US$ 1 trillion in 2005 (ibid.). These 'creative' culture industries are integrally linked to the application of digital technology, which makes it possible to develop new forms of digital culture and to transform patterns of social interaction as well as cultural production.

Such a policy promotes what Gil calls 'informatics literacy' through educational programmes offering universal access to information and computer skills. For example, the city of São Paulo uses open source software in its 'telecentres' that offer e-mail, Internet access and training in basic computer skills. These telecentres shifted to GNU/Linux instead of Windows, OpenOffice instead of Microsoft Office, and the Galeon browser instead of Internet Explorer. During a major expansion of the service to add another eighty telecentres, the city bought 1,600 computers, paying about US$ 440 per machine and saving about US$ 470 per machine in software licensing, according to Sérgio Amadeu da Silveira, who was co-ordinator of 'electronic government' for the city before he became president of ITI. This was the lowest price ever paid by public administration in the country. Silveira stated, '[w]e don't have anything against Microsoft, but we want to develop technology here' (Cruz, 2002).

Brazilian cultural policy to promote free and open source software thus combines contemporary goals of digital inclusion and informatics literacy with longstanding efforts to develop technological autonomy. It represents an alternative to neoliberalism by promoting the development of new kinds of communities, social relationships and forms of interaction in which a diverse range of Brazilians gain access to information technologies. In this case, the form of the software as free or open source is less important than the social context within which it is used. The grassroots, community-based relationships and inclusive nature of these efforts have the potential to contribute to an alternative form of globalization from below. This alternative would be grounded in the participation of local communities in accessing and creating digital culture as part of the broader digital commons. Such forms of digital inclusion are essential to realize the vision of democratization and social justice imbued in the digital commons as a global public good (Held, 2004).

CONCLUSION

The nature of software technology, and in particular the ability for hackers to transform programmes if they have access to the source code, makes it a dynamic productive force for efforts to create alternative forms of globalization from below. Free and open source software can provide a code for the digital commons, powering the Internet and global computer networks as the technological infrastructure for global production, culture and communications.

These technical qualities have been implemented within a changing political and economic context over the last several decades. Hackers, computer users, transnational corporations and small businesses crafted three distinct models for engaging in the software market, each of which has complex implications for building globalization from below. For the most part, the proprietary model reinforced the power of global capital within the dominant neoliberal form of globalization. Even this model, however, had unintended consequences for the prospects of developing alternatives to neoliberalism, as corporate activities within the proprietary market during the 1960s also advanced the development of a free software model. The free and open source model has cetainly contributed most directly to building a digital commons as an alternative form of globalization. Open source firms like Red Hat focused more on developing the market for open source software, while new institutions like the FSF concentrated on creating a digital commons. Finally, IBM's dual strategy of developing open source systems as a resource for its proprietary software had mixed implications: IBM's substantial contributions of funding and resources to the development of open source systems were limited by their connections to proprietary software. Hence, those systems could not be fully part of the digital commons.

The Brazilian case illustrates a different level of complexity of building globalization from below, in the context of power relations between the global North and the global South. The Lula administration's shift to free and open source software undermines the historical domination of global capital over Brazilian development. Since Microsoft's Windows operating system is used in over 90 per cent of the world's personal computers and in 60 per cent of servers in Brazilian firms (Marques, 2005; Pillar, 2006), even open source systems that mix proprietary and free software offer an alternative to Microsoft's dominance of the international and Brazilian markets. The Brazilian government and private firms have been able to save money on licensing fees and to promote the development of local technologies through the use of such systems. The alternative quality of these systems lies in their potential to foster local technologies, skills, employment, scientific and industrial capacities. Such changes challenge neoliberal globalization at the level of national development, as well as laying the technological groundwork for processes of digital inclusion and the creation of new forms of digital culture.

Around the globe, the creators of free and open source software are thus contributing to the development of a digital commons, where new forms of collectivity and grassroots participation in economic, political, social and cultural life become possible. Brazilian cultural policy offers an imaginative model to pursue the potential benefits of digital literacy and digital inclusion, where the skills and opportunities to use information technology are made available to historically disenfranchised social groups. This is an ambitious plan, and since this policy is relatively new, its effects are largely unknown. Nonetheless, it presents an intriguing alternative grounded in a vision of diverse participation in a software-sharing community.

The wide range of hackers, government agencies and private corporations currently using free and open source software attest to the potential for systems to transform the myriad activities germane to economic, political, social and cultural life. The users of the telecentres of São Paulo provide just one example of the way that these systems are being made available to broader sectors of the population (Cruz, 2002). By establishing the Free Software Foundations, Stallman created a new kind of institution to foster the creation and provision of free software as a code for the digital commons. Through cultural policy, Gilberto Gil is seeking to make the digital commons more widely available as a global public good.

Under the dominant neoliberal form of globalization, recreating any form of the commons entails struggles against government and corporate efforts to open markets around the world to global capital. In the case of free and open source software, these struggles involve resisting the 'neoliberal drive to make property out of everything' (Coleman, 2004: 509), which limits hackers' freedom to write code available to all and exacerbates disenfranchised social groups' lack of access to computers and the Internet as the technological infrastructure for globalization. These formidable obstacles make visions of the commons, and the struggles to realize them, increasingly significant. They are indispensable parts of the process of forging alternatives to social inequality and corporate control, of Held's 'project of global social democracy'. The promise of these partial, incomplete endeavours to recreate forms of the commons lies in the tenuous balance between a global, long-range vision for an inclusive world, and the complex, day-to-day attempts to make that world a reality. In the words of Gilberto Gil (2004), '[w]e are practising democracy. And we invite everyone to participate'.

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