Marx in the Age of Digital Capitalism

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Marx in the Cloud

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Nature builds no machines, no locomotives, railways, electric telegraphs, self-acting mules etc. They are organs of the human brain, created by the human hand; the power of knowledge, objectified. The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the *general intellect* and been transformed in accordance with it; to what degree the powers of social production have been produced, not only in the form of knowledge, but also as immediate organs of social practice, of the real life process (Marx 1858).

1 The Digital World at a Critical Juncture

The digital world is at a critical juncture represented by two clashing visions of the information society. The first imagines a democratic world where information is fully accessible to all citizens as an essential service. This world manages information through forms of regulation and control that are governed by representative institutions whose goal is the fullest possible access for the greatest number of citizens. Governance might take multiple forms, including different combinations of centralized and decentralized approaches at local, regional, national, and international levels. The second imagines a world governed by global corporations and the surveillance and intelligence arms of national governments. Under this model, the market is the leading force shaping decisions about the production, distribution and exchange of information and those corporations with market power hold the most influence. This influence is tempered by the control needs of the state represented primarily by its security and intelligence agencies.

Neither of these approaches ever appears in its pure form but each has historical precedents in society and especially in communication and information technology. The democratic model of governance had the upper hand in the early years of the internet when early developers based primarily in universities organized the information network as an open, decentralized, and democratically managed system primarily interested in connecting active citizens rather than enlarging an audience of relatively passive consumers. This began

to change in the early 2000s when companies began to recognize the profit potential in the new global information networks and governments determined that it would enable them to deepen traditional surveillance networks and create entire new ones.

This tension between these competing approaches takes many forms including, for example, policy disputes such as the emergence in 2013 of a conflict in the United States over network neutrality. Would the internet remain based on the principle, admittedly breached more often than its supporters would like, of equal access, or would the market and the need to deliver audiences to advertisers skew its shape in favor of those eager to build shareholder value (McChesney 2013)? Network neutrality attracted enormous interest with the U.S. Federal Communications Commission deluged with a record number of submissions attempting to sway decision-making on the issue. Important as it is, the net neutrality debate is merely symptomatic of the much larger issue of governing the digital world. Specifically, debates about this issue have grown considerably in importance with the rise of new digital systems including cloud computing, big data analytics, and the internet of things. Since the latter is less well developed than the first two, the chapter will address the cloud and big data and briefly return to the internet of things in the conclusion.

2 Cloud Computing

Cloud computing is a model for enabling on-demand network access to a shared pool of ubiquitous, configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. The cloud, as it is called, is the fastest growing segment of the IT sector and because it enables distant storage, processing, and distribution of data, applications, and services for individuals and organizations, industry observers view it as a disruptive and transformational technology. The cloud is actually housed in data centers, large information factories containing tens or hundreds of thousands of servers, that are linked to telecommunications systems that provide data and services to subscribers,who pay on demand for timely delivery to their individual smart phones, tablets and computers (Mosco 2014). Big data analytics is a term that refers to a form of research using data stored primarily in the cloud. The data centers that store and process information, emails, audio and visual files as well as software and apps for individuals and organizations can also analyze their large data sets, thereby adding value that is attractive to

users for whom the provision of timely answers to questions is essential to meet their goals.

There are several critical problems associated with cloud computing and big data including growing concentration of power in a handful of companies and in the surveillance arms of the state with which they are closely associated. These technologies also create significant environmental problems including massive drains on the global electricity grid for powering and cooling data centers and in the use of backup systems essential for maintaining 24/7 access to data and services such as access to Gmail, Facebook, Twitter, and iCloud. Furthermore, the cloud and big data enable massive breeches of privacy and pervasive surveillance arising from widespread hacking but more significantly because there is significant value in cloud computing and data analytics from the profit to be made by selling information gathered in the cloud. In addition, organizations like the National Security Agency and the CIA use the cloud and big data analytics to carry out their mission as spy agencies. The cloud and big data also create enormous problems for labour as they make possible massive outsourcing of jobs in the specific fields occupied by information technology professionals and, more ominously, in the many occupations of knowledge workers, from teachers to journalists from lawyers to accountants, whose analytic skills can increasingly be moved to the cloud. The cloud and big data can also subject these jobs to deepening surveillance and control. Finally, the cloud and big data raise a significant epistemological issue. Lost in the enthusiasm surrounding the potential, especially of big data analytics, is the threat to the pluralism of long-established and successful ways of knowing. The singular reliance on the correlational analysis of quantitative data, to the exclusion of historical, theoretical, qualitative and causal analysis, what I term *digital positivism*, narrows the scope of research that is critical for addressing major social problems.

3   Digital Capitalism and the Surveillance State

Even though it is still young, in a pattern consistent with one Marx identified time and time again, the cloud computing industry is increasingly characterized by the concentration of power in a handful of companies and their allies in the surveillance state. The dominant company is Amazon Web Services, a subsidiary of the global online retailer. AWS uses its dominant position in online sales to undercut the competition in pricing cloud services. It has been so successful in this practice of predatory pricing, one that dominant companies

have used since the beginnings of capitalism, that smaller companies have either been driven out of the marketplace or forced to concentrate on narrow niche positions. Remaining industry leaders include Google, Microsoft, Apple and Facebook, old powers in the computer industry such IBM, Cisco, and H-P, which are scurrying to shift from their traditional practices of supplying corporate IT departments to leading them into the cloud, and companies like Rackspace and Salesforce that came of age with cloud computing (Mosco 2014, 48–66).

In addition to using its success in the online world to build a dominant position in the cloud, Amazon demonstrates another well-worn tendency identified by Marx: the ability to use its political influence for economic advantage. AWS provided cloud and big data services to the Obama campaign organization in 2012 and its success in identifying and delivering voters to the Obama forces with the same success that it delivers online users to advertisers, is widely considered one of the most important reasons for the President's re-election (Cohen 2012; Hoover 2012). In a pivotal decision that some suggest was a reward for its campaign success, Amazon was awarded a $600 million contract to provide cloud and big data services to the CIA. Whatever the reasons for the award, which IBM formally challenged unsuccessfully, it brought together leaders in digital capitalism and the surveillance state to create a marriage that would certainly benefit both parties, but it also created a dangerous direct connection between anti-democratic forces in the United States. To further the role of the surveillance state in the cloud computing power structure, the National Security Agency is building one of the world's largest cloud computing facilities deep in a Utah mountain (Bamford 2012).

The US dominates cloud computing but China is rapidly developing its own industry with strong government support that extends to including the cloud in its latest five-year development plan. Government and business, with the investment of some US firms like IBM, have joined to develop entire cloud cities that feature data centers, research and development facilities, corporate offices, training facilities as well as the housing, shops and infrastructure that make up cities of all types. The company Alibaba is a leader in China's cloud industry and, along with Baidu, Tencent and a handful of other firms, makes use of government protection against foreign competition to rise in the global ranks. In 2014 Alibaba made its debut in the United States by launching the most lucrative IPO in history (Hardy 2014). Although it controls only three percent of the global cloud industry marketplace, China's firms are growing and represent threats to the global political economy that would not surprise Marx. Moreover, Alibaba is the leading online source of materials essential to produce fissionable material, a clear threat to global stability. Finally, China's data

centers are subject to rules set by its authoritarian government which raises questions about what will happen when more of the world's digital information is stored and processed in that country (Clover 2014).

4   The Cloud and the Environment

In addition to representing the concentrated power of capital and the surveillance state, cloud computing presents significant environmental challenges. Data centers filled with always-on servers are major drains on the global electricity grid. Requiring both operational power and constant cooling, data centers even in these early years of the cloud industry, already consume about 3 percent of the global grid. Moreover, the pressure to provide uninterrupted service leads cloud companies to develop several layers of backup which create serious pollution issues. These include diesel generators that release known carcinogens, among other pollutants, into the air, and chemical batteries that are known to pollute ground water supplies. Some companies have responded to the pressures of investigative journalists and environmental organizations, especially Greenpeace, by introducing solar and other more sustainable forms of power (Mosco 2014, 123–137). Noticeably absent is Amazon which refuses to adjust its power supplies or to cooperate in any way with organizations concerned about the company's environmental record. But even with some adjustments possible, the entire cloud industry is under great pressure to cut costs and that includes making use of the least expensive power supply. It is therefore more likely that companies, in order to survive Amazon's ability to cut costs and make use of its political influence, will increasingly emulate the bleak environmental record of the industry leader (Cook 2014).

5   Hacking, Corporate Surveillance, State Surveillance

Just as ruthless competition reduces the likelihood that cloud companies will improve their environmental record without improvements in their bottom line, it also reduces the probability that companies will moderate their surveillance practices. On one level, the business model of a cloud computing company involves storing and processing data for individual and organizational customers who pay for on-demand access to their data and to services, such as managing and providing insights into sales records based on big data analytics. But, as Marx explained, companies need to maximize profit by making use of

all available resources. Today, that means engaging in what some might see as questionable surveillance practices such as those that lead Google to read customer email to refine the advertising directed at them or Facebook to manipulate the newsfeed of users to increase the amount of time people spend with the social media site and to improve directed advertising. It is hard to imagine that Marx would be surprised to learn that Facebook has directed "bucket list" ads to people who share a cancer diagnosis on the site. Relentless invasion of privacy and deepening surveillance are essential elements of the basic business plans of cloud companies who profit by making the fullest possible use of the data stored in their servers to package and deliver valuable information on user identities to their paying clients. Since most legal constraints are minimal, the only significant way around these practices is to avoid using the cloud or to pay for extra security through the use of customized "private" cloud services (Mosco 2014, 137–155).

Similarly, it is fundamental to the missions of state agencies like the NSA, the CIA, and their counterparts throughout the world that they gather, store, process, and use as much information as possible about online users. Teaming with Amazon helps the CIA to deepen and extend its digital spy operations as do the accelerated expansion of the NSA's facilities and the continuing cooperation of the major cloud and social media firms in their activities. The military-information complex is strong and growing and the implications for personal and organizational privacy are profound. Nevertheless, while the revelations of Edward Snowden, Glenn Greenwald, and others have prompted some minor reforms, most media attention is directed at privacy and surveillance violations that emerge from the actions of criminal hackers who regularly demonstrate the relative ease with which they can break through the security that cloud companies allege protects the security of customer data. There is no denying the significance of the September 2014 attacks on ten financial institutions that affected 83 million consumer and business customers at JP Morgan Chase alone (Goldstein, Perlroth, and Sanger 2014). The regularity of such attacks, most of which are not reported by companies fearful of tarnishing their brand, demonstrates the porous nature of the cloud. Nevertheless, concentrating attention on these criminal acts alone detracts attention from the surveillance at the heart of the everyday business plans of cloud computing companies and the mission of government agencies. Eliminating or even dampening legal surveillance would diminish the profits of cloud companies and their business customers, as well as limit the ability of governments to gather data on everyone.

6   Cloud Computing and the Threat to Knowledge Labor

Cloud computing and big data pose threats to professional labour in IT and across the knowledge occupations. In fact, one expert consultant prefers to define cloud computing as "nothing more than the next step in outsourcing your IT operations" (McKendrick 2013). This is in keeping with a general tendency which one researcher for the major consulting firm Gartner Associates summarizes succinctly: "The long run value proposition of IT is not to support the human workforce – it is to replace it" (Dignan 2011a). This view remarkably echoes one that Marx himself and more contemporary neo-Marxists like Harry Braverman presented, to the effect that capitalism is driven to replace living labour with dead labor, that is, to replace the human workforce with machinery.

Cloud computing and big data analytics can advance this process in several ways. They create immediate opportunities for companies to rationalize their information technology operations. Again, from Gartner, "CIOs believe that their data centers, servers, desktop and business applications are grossly inefficient and must be rationalized over the next ten years. We believe that the people associated with these inefficient assets will also be rationalized in significant numbers along the way" (Dignan 2011a). Cloud computing companies maintain that their systems can break a pattern in business organization that began when the first large computers entered the workplace. Every business or government agency believed it was essential to operate their own IT department and, for the larger organizations, their own data centers. With the cloud, companies can move their IT and related business processes out of the organization. Why, they insist, is it necessary to build and operate thousands of organization-specific facilities when a few large data centers can meet the demand at lower costs with fewer professional personnel? This process has already begun and early studies demonstrate that even with limited downsizing of IT departments, organizations are saving between fifteen and twenty percent of their IT budgets (Howlett 2014).

The cloud also makes possible the widespread rationalization of all knowledge and creative labour because the work of these occupations increasingly involves the production, processing, and distribution of information. According to one observer, "In the next 40 years analytics systems will replace much of what the knowledge worker does today" (Dignan 2011b). A 2013 report concluded that 47 percent of the current U.S. workforce is directly threatened (Frey and Osborne 2013). The timing of this forecast may or may not be accurate but there is no doubt that the current trend is to move increasing amounts

of the work that knowledge workers perform to the cloud, specifically through intelligent software systems. One study estimates the potential impact of this move by 2025 will total $5.2 to $6.7 trillion with additional labour productivity the equivalent of 110 million to 140 million knowledge workers (Manyika 2013, 40). Key applications include "smart learning in education," pioneered today in MOOCS (Massive Open Online Courses) and blended learning systems that include automated and classroom learning. Analytical systems in the cloud are also becoming prominent in health care, the law, accounting, finance, sales and the media. Thanks to the cloud, organizations in the private and public sectors are encouraged to outsource all but their core business processes to companies like Salesforce.com which specializes in managing the vast databases of customer information, a function that traditional marketing and client service departments within organizations once performed. The expansion of outsourcing to the cloud raises serious questions for the entire global system of shifting work outside the corporation or government agency. According to Gartner, "That outcome will hit all economies – especially emerging ones like India that now dominate technology outsourcing."

Cloud computing and big data also expand the range of potential outsourcing practices. It may not be the case that, as Forbes magazine declares, "We are all outsourcers now, thanks to Cloud," but it certainly makes feasible more kinds of outsourcing: "Outsourcing is no longer simply defined by multi-million-dollar mega-deals in which IT department operations are turned over to a third party. Rather, bits and pieces of a lot of smaller things are gradually being turned over to outside entities" (McKendrick 2014). Amazon is a leading force in this process with its Mechanical Turk service that charges individuals and organizations to outsource small tasks to an online army of piece workers. In essence, the cloud and big data make possible the expansion of labour commodification throughout the world.

They also make possible greater control over the workplace by expanding opportunities for surveillance and for the analysis of large data sets that facilitate rapid redeployment of workers to meet corporate needs. According to one leading business publication, "As Big Data becomes a fixture of office life, companies are turning to tracking devices to gather real-time information on how teams of employees work and interact. Sensors, worn on lanyards or placed on office furniture, record how often staffers get up from their desks, consult other teams and hold meetings" (Silverman 2013). Once again, as Simon Head notes, Amazon is a leader: "Amazon equals Walmart in the use of monitoring technologies to track the minute-by-minute movements and performance of employees and in settings that go beyond the assembly line to include their movement between loading and unloading docks, between packing and

unpacking stations, and to and from the miles of shelving at what Amazon calls its 'fulfillment centers' ..." (Head 2014). Big data analytics enable companies to do more than just keep an eye on everything workers do. It provides new opportunities to actually make use of the data gathered in the course of monitoring the shop floor and the office. For example, Starbucks uses the data it gathers on customer flows through its stores to schedule worker shifts on short notice. This creates havoc for many workers, particularly those whose lives are tightly scheduled with child care, classes, and other jobs that make responding to constantly changing work times very difficult. Low-income workers are especially hard hit by a process that forces them to operate as flexible machines capable of responding to whatever logistical demands the companies that carry out big data analysis require.

7   Digital Positivism

The growing reliance on the cloud and especially on big data analytics raises a significant epistemological issue. One can observe a narrowing of what constitutes legitimate knowledge to the results of correlational methods applied to quantitative data. Big data is increasingly *the* model for examining not only scientific evidence but social science and humanities evidence as well. Big data enthusiasts take this to a striking, if not startling, extreme: "This is a world where massive amounts of data and applied mathematics replace every other tool that might be brought to bear. Out with every theory of human behavior, from linguistics to sociology. Forget taxonomy, ontology, and psychology. Who knows why people do what they do? The point is they do it, and we can track and measure it with unprecedented fidelity. With enough data, the numbers speak for themselves" (Anderson 2008). This view, and even considerably less strident perspectives on big data, embody a *digital positivism* that singularly valorizes one way of knowing above all others. It questions knowledge gathered through qualitative research that, for example, through in-depth interviews and close observation, seeks to understand subjective experience and intersubjectivity. It also devalues research grounded in historical, theoretical and disciplinary understandings of a field. If indeed the numbers speak for themselves then there is little need for these or for anything resembling the kind of thinking that has guided social science and humanities research for centuries. It is an approach congenial with capitalism because there is a close relationship between the quantification of everything, including the self, and the commodification of all things. As devices like the iWatch proliferate and make it possible to gather detailed quantitative data on each and every user, it

is easier for Apple and its clients to profit from its sale. In this case the quantification of health states advances the commodification of the self.

There is no denying the methodological value of research based on the quantitative analysis of large data sets. But its usefulness does not justify sequestering other forms of research to lesser status. This is especially important because there is mounting evidence that big data can create big problems. In some cases, big data research produces remarkable results, as when Google succeeded in forecasting 2012 flu outbreaks across the United States by correlating search terms for flu symptoms with the incidence of flu. In beating the Centers for Disease Control with the speed and accuracy of its forecast, Google believed that it had the best predictive tool, that is, until 2013 when its model proved remarkably unreliable. It turns out that when the numbers speak, they often do so unreliably. It is also tempting for companies, most notably Facebook, to manipulate their very large data sets if such actions might boost ad revenue. Large data sets can also hide many errors that are not likely to be detected without time-consuming careful scrutiny. For example, if it were not for a hard-working PhD student, the critical errors in a paper that used large data sets to justify national economic austerity policies would not have been discovered. These and other examples document the problems associated with using big data analytics exclusively and the related difficulties of drawing conclusions based on correlations without taking into account theory, history, human subjectivity, and causality (Mosco 2014, 175–226).

8   Selling the Cloud

The importance of the cloud and big data for business and the state helps to explain why they are being promoted so vigorously. So too do the significant problems. Cloud promoters are using every available outlet and opportunity to convince individuals and businesses to move to the cloud. Advertising, social media, corporate and government reports, as well as lobbying and trade fairs are all used to demonstrate why the cloud and big data are essential. Promoters either ignore the problems or use this massive promotional space to downplay their significance. Whereas advertising gives promoters the opportunity to shout the message in a blunt and direct fashion; more legitimate sources, like the global public-private partnership of the World Economic Forum make it more subtle, as when the WEF concluded in a report on the cloud that experts believe "our society must move past the fear of data and privacy breaches" (World Economic Forum 2012, 99).

9   **Chains of Accumulation and Chains of Resistance**

Cloud computing and big data are vital for building and managing the global supply chains necessary to sustain the complex networks of transnational capital. There are enormous risks for business and the state in relying on these networks in a turbulent world. Private think tanks like Frost & Sullivan make it clear that the surveillance and analytic capabilities of the cloud and big data are essential for managing potentially disastrous risks to the many global chains of accumulation (Frost & Sullivan 2012). But neither promotion nor risk management can stop the chains of resistance that are also growing worldwide.

Where are the signs of resistance? First, supply chain disruptions make it more difficult to deploy cloud systems around the world and organized resistance from workers may alter the potential to profit from the cloud. The labour force in China, the base of global electronics supply chains, has grown restive in recent years, prompting tighter workplace controls and a redeployment of electronics manufacturing sites. It is unlikely these measures will do anything more than delay the inevitable choice between substantially raising the living standards, including the wages, working conditions and political freedom of China's workforce, or face escalating mass civil unrest. One can deploy suicide prevention curtains for just so long. The acknowledgment of unrest in China's once-placid factories has reached the mainstream Western press where an account in *Time* magazine offered this startling set of observations: "'The way the rich get money is through exploiting the workers', says Guan Guohau, another Shenzhen factory employee. 'Communism is what we are looking forward to'. Unless the government takes greater action to improve their welfare, they say, laborers will become more and more willing to take action themselves" (Schuman 2013). But this is no more startling than the kinds of protests that China's workers are mounting. In order to build data centers, the country will have to expand it electricity grid and this is especially disruptive in urban areas such as Wuhan where in the summer of 2014 people protested the development of new electrical substations. They did so by slowly parading their cars through the affected areas with clearly visible signs noting a naked inflatable doll of a female figure strapped to the back of one of them. The signs read: "we are giving you this inflatable doll so you don't have to rape our will" (Personal correspondence and photograph from a friend in Wuhan). Resistance in China is matched by similar upheavals in India where expected prosperity from the development of an information industry has stalled. As a result, the labour movement has grown with worker organizations like the New Trade Union Initiative building strong coalitions (Stevens 2014).

It is not only the base of the global supply chains created by major cloud companies that can create disruptions. Chains of resistance can also form in the advanced nations of the West where the labour process is certainly more humane than in Chinese electronic assembly plants, but very far from what applies in the headquarters of these companies. One hot spot for labour tensions is Germany where Amazon has established eight distribution centers employing 8,000 workers. Germany is important for the company because it is the source of 14 percent of its revenues (Wingfield and Eddy 2013). The country has not received a great deal of attention in struggles over global supply chains, but it has a long history of battles with Walmart which abandoned Germany in 2006 rather than bend its worldwide labour standards to meet the expectations of German workers and especially their union Ver.di which represents over two million employees in the service sector. German workers and their unions have considerably greater power than their counterparts in the United States and the UK. Mobilizing workers across the country, Ver.di's actions succeeded in ending Walmart's presence in the country. In 2013 a new battle erupted over Amazon which, in the view of German workers, is attempting to impose "American-style management" by relying on ruthless labour practices such as hiring thousands of low-wage and mainly foreign temporary workers and the security police necessary to maintain control. This has enabled the company to cut prices and drive out competition, including one German firm. According to a union leader, Amazon applies rigid controls to its workforce: "Everything is measured, everything is calculated, everything is geared toward efficiency. People want to be treated with respect" (Ewing 2013). The company denies these claims, arguing that it hires foreign temps because there are not enough local workers. But the online giant, now the largest cloud computing company in the United States, faced embarrassment when it had to fire a security firm hired to police one of its plants because some of the firm's employees, dressed in outfits associated with neo-Nazi groups, roughed up people trying to film activity outside the plant. The company maintains that it could not possibly know the backgrounds of all those it hires and insists that, while it refuses to negotiate with the union, it does pay workers well.

What will happen in this key node of Amazon's global supply chain is uncertain. Workers mount regular protests using mass mobilization, guerilla theater, and online global petition drives (37,000 signatures received by March 2013). But Amazon has refused to back down. In May 2013, workers at the giant Amazon distribution center in Leipzig walked off the job, marking the first reported strike at an Amazon facility (Wilson and Jopson 2013). The story continues to unfold with Ver.di leading another strike against the company in 2014.

It is not only in the material workplace that Amazon labour is restive. The company operates a global system of piecework in the cloud that critics have called a "digital sweatshop" (Cushing 2013). The Amazon Mechanical Turk (AMT) employs a large body of "crowdsourced" workers, which Amazon calls Providers (also known as Turkers), who carry out minute tasks online for Requesters who pay piece rates for writing descriptions of products, identifying individuals in images, or just producing spam (a 2010 study by NYU researchers determined that spam constitutes as much as 40 percent of the jobs) (Ipeirotis 2013). The system was originally set up by Amazon to carry out work that could be done online but required some human involvement. The typical job was sorting merchandise into categories based on color or style for the company's massive online warehouse. It was so successful that Amazon decided to become a job broker for corporations needing people to do things like look up foreign zip codes or transcribe podcasts.

For managing the service, Amazon receives 10 percent of the value of a completed job or, as it is called, a Human Intelligence Task (HIT). Although Turkers include professionals, the vast majority are semi-skilled workers who provide their credentials to Requesters, and, once cleared, choose among posted tasks. Workers in the United States are paid in cash but many foreign workers are primarily given the option to accept gift certificates. Exact figures are hard to pin down, but it is estimated that the industry employs over 200,000 workers, and by 2011 was earning about $375 million annually (Cushing 2013). There is also growing evidence that workers are less than happy with the system. It did not take long for them to realize, as one put it, "They make it sound like you can just do a few tasks in your free time in between other things, but if you worked like that, I believe you would make about a dollar a day" (Cushing 2013). Because companies have an enormous workforce to draw from, they can pay the lowest possible rates, a dollar or two an hour is not unusual, and demand swift and accurate completion of jobs. Workers who mess up a job are dropped or banned from applying again. In January 2013 Amazon stopped accepting new applications from international Turkers because of what the company concluded were unacceptable levels of fraud and poor worker performance. Since international workers are more likely to accept the low pay and constant demands, Requesters have begun to set up their own Turk operations.

Upset about the system, Turkers use their online world to vet Requesters and contact other Turkers. The result is Turkopticon, a piece of software that adds functionality to sites that post HITs by adding ratings, reviews of employers, and advice to exploited Turkers (http://turkopticon.differenceengines .com/). According to one scientist who has worked on AMT 28,000 times, "There's no sick leave, paid holidays, anything like that on Turk. There is no

arbitration, no appeal if you feel that you have been unfairly treated, apart from a stinging review on Turkopticon" (Hodson 2013). Furthermore, worker complaints, fraud, and a host of negative consequences resulting from AMT's sweatshop in the cloud have encouraged other firms to set up somewhat more hospitable operations. For example, the firm MobileWorks pays the minimum wage in effect in the country where the work is being done, assigns each worker a manager whose job it is to deal with problems, and provides opportunities for worker mobility (Hodson 2013). It is uncertain whether the emergence of more worker friendly companies will restore some of the credibility to online piecework. Much will depend on whether big companies like Amazon respond to resistance by reforming the labour process in the cloud.

Worker organizations, especially trade unions, are not often discussed alongside cloud computing. Only a handful of cloud providers, mainly the older computer and telecommunications firms such as IBM and Verizon, have to deal with organized labor. But as we have seen in the case of Apple's experience with Foxconn in China and Amazon in Germany, cloud companies, as they become inextricably bound to global supply chains, face the resistance of organized labor. These are examples of a process at work in the broadly defined knowledge and cultural industries that brings together workers across what were once discrete sectors. As a result, unions that once represented only telecommunications workers, now include creative and technical talent in the audio-visual, writing, service, and technology sectors. The Communication Workers of America and its counterpart in Canada, which in 2013 merged its communications and power workers union with the union representing auto workers to form Unifor, are good examples of worker organizations that have followed the path of technological convergence in its organizing efforts. The 2012 merger of the Screen Actors Guild and the American Federation of Television and Radio Artists brings together the major Hollywood unions for the first time to face off more effectively against the increasingly integrated Hollywood media industry. Moreover, individual unions are not only expanding across the converging communication and information industries, they are forming large transnational organizations like Ver.di and UNI Global Union. These transnational unions are better equipped to deal with powerful multinational companies because they have enormous membership and because they are well funded. Furthermore, the scope of their membership enables them to better represent the convergences in both the labour process and the working conditions among information, cultural, and service workers. It also makes it possible to build bridges across the divide separating workers at different spatial and occupational points in the global division of labor.

Ver.di was founded in 2001 and by 2013 reached 2.3 million members, primarily in Germany but in other parts of the world as well. It represents workers in thirteen sectors, all of which are increasingly affected by the rollout of cloud computing including financial services, health and social services, education, science and research, media and culture, telecommunications, information technology, and data processing, postal, transport and commerce services. Its members work in government and business at almost every level of occupational skill and function. Not only can the union mobilize a large and diverse workforce, it can also draw on the specialized talents of its members who help the union to tighten and secure its internal communication and carry out guerilla theater protests that attract widespread media attention. UNI Global Union was created in 2000 when three international worker federations in the information, media, and service sectors came together to form a genuinely global federation of knowledge workers. Today, it gives voice to 20 million workers in 150 countries through 900 affiliated unions in a broad range of fields including information technology and services, media, entertainment and the arts, gaming and sport, finance, commerce and security, as well as the growing numbers of workers who toil for temporary employment agencies. Among its major activities is negotiating global agreements with transnational companies to address important issues such as child labor, discrimination, and the right to organize local unions. By early 2013 it had completed 48 such agreements with a wide range of companies, including a number in the communication and information technology sector. In 2014 it set its sights on negotiating fresh agreements with major transnational firms including IBM and Disney.

Ver.di and UNI are not alone among converging unions and international labour federations that are having an impact on global supply chains, including those central to the growth of cloud computing. But it is uncertain whether this development is the harbinger of a significant upsurge in global labour activism or a defensive posture that can at best slow down the inevitable decline and demise of organized labor. That depends, in part, on how one defines organized labour because another important trend is the growth of labour organizations that are not formal trade unions. These worker associations resemble unions but, either out of choice or necessity, remain outside the legal and political structures that govern the operation of trade unions. They operate all over the world and research has documented their importance in China, India, Europe, and the United States (Mosco, McKercher, and Huws 2010). They are especially active in the information, communication and cultural sectors where worker associations have represented employees in occupations ranging from call centers to software engineering. Worker associations have won major victories for contract employees at Microsoft and for

telecommunications workers in India. While they do not typically negotiate contracts, they have provided workers with legal representation, group medical insurance, training, model contract language, counseling, and support for collective resistance without suffering from some of the bureaucratic entanglements that plague traditional trade unions. These associations are particularly active among contract and temporary workers where, for example, the Freelancers Union has signed up 200,000 members in a wide range of jobs including law, app and software development, graphic arts, accounting, writing, editing, and consulting. Worker associations do not just differ from trade unions in what they lack, a system of formal bargaining with employees, but in their emphasis on mutual assistance outside, as well as in, the workplace. They follow the social movement tradition of earlier trade unions, which provided workers with social support including family assistance, housing, and a source of collective power and community. As the head of the Freelancers Union puts it, "The social unionism of the 1920s had it right. They said: 'We serve workers 360 degrees. It's not just about their work. It's about their whole life'. We view things the same way" (Greenhouse 2013). As companies move to the cloud, it is likely that workers and their organizations will follow. Cloud computing and big data deepen the chains of accumulation that power digital capitalism. But they also produce chains of resistance, from China to Silicon Valley. The success of resistance will depend on how well workers, especially those in the knowledge workforce, are able to unite and develop strategies both locally and globally. Any successful plan of action needs to include a policy vision for the cloud that addresses its potential for public benefit and its serious flaws including corporate concentration, environmental damage, deepening surveillance from the NSA and its counterparts, the growing fetishization of big data analytics, and the many threats to labor. Can worker organizations join policy activists fighting for a democratic internet to make the cloud a public utility to serve democracy?

10   The Coming Computer Utility

The cloud and big data are important forces for global capitalism and for the surveillance state. But their shortcomings and the social problems they create are also significant. Building and maintaining global chains of accumulation in the cloud is not easy and certainly far from inherently stable (Huws 2014). The resistance from social movement and labour organizations adds stress to the tenuous nature of global networks. But it is far from clear what the challenges amount to beyond the inevitability of chronic disruptions. They certainly do not

guarantee a fundamental change from a digital world governed by markets that are controlled by a handful of companies and the surveillance arms of governments.

One starting point is "ruthless criticism," of the sort that Marx (1843) described in his letter to Ruge as "ruthless both in the sense of not being afraid of the results it arrives at and in the sense of being just as little afraid of conflict with the powers that be." Empirical descriptions of resistance movements contribute a next step. Along with and beyond these strategies, we need a debate about alternatives to digital capitalism, digital positivism, and the surveillance state. Specifically, how can we move the digital world closer to the vision of the General Intellect where information is a resource available to all, where it is managed by citizens democratically, where the concept of a public cloud means a digital world subject to public control rather than one where rights are limited to the right to purchase digital services?

Given the power of the dominant cloud companies and the NSA, it is admittedly difficult to envision an alternative. It is hard to imagine that another digital world is possible. To bring it closer to home, it is important to uncover a subterranean history of computer communication, where the concept of delivering information publicly was not just open to debate but was also a lived reality. It is too soon in the debate to produce anything approaching a blueprint for the alternative but not too early to document and debate the range of historical possibilities that can provide the elements for one or more genuine alternatives to the status quo. These include the Soviet cybernetics program of the 1950s–60s which sought to use computers for national economic planning and which was viewed by adversaries, most notably the U.S. government, as a significant threat to American economic leadership (Gerovtich 2010). In the 1970s the socialist government of Chile initiated Project Cybersyn which was committed to a publicly controlled, decentralized system of computer-based planning that would help the country achieve workplace democracy (Medina 2011). In the 1980s the debate came to North America when policy makers discovered the work of Canadian analyst Douglas Parkhill who had advanced the idea of a computer utility, modeled after public utilities for water and power, which would deliver an equally essential resource, information (Parkhill 1966). These ideas were tested in the US, UK, Canada, and France with teletext and videotex systems that delivered information to kiosks located in public places like post offices and airports as well as to the home. In the 1990s they grew into the internet which began as a decentralized, self-managed network open to all those with access to the necessary technology. But at the turn of the new century, this burgeoning public network was challenged by companies aiming to shape it into a commercial profit machine and by governments that would use

the internet to deepen their control over citizens within and outside their borders. The information revolution has met its counter-revolution. Nevertheless, the lessons from the ideas and experiences with genuinely public networks, including their successes and failures, live on and can provide building blocks for creating genuine alternatives that can help to envision and build a new General Intellect for the digital world.

References

Anderson, Chris. 2008. The End of Theory: The Data Deluge Makes the Scientific Method Obsolete. *Wired*. June 23. Accessed October 27, 2014. http://archive.wired.com/science/discoveries/magazine/16-07/pb_theory.

Bamford, James. 2012. The NSA Is Building the Country's Biggest Spy Center (Watch What You Say). *Wired*. March 15. Accessed October 25, 2014. www.wired.com/threatlevel/2012/03/ff_nsadatacenter/all.

Clover, Charles. 2014. Alibaba: Weapons of Mass Ecommerce. *Financial Times*, September 26. Accessed October 25, 2014. http://www.ft.com/intl/cms/s/0/2a19e07c-43ef-11e4-8abd-00144feabdco.html?siteedition=intl.

Cohen, Reuven. 2012. "How Cloud Computing Helped Obama Win the Presidential Election." *Forbes*. Accessed October 25, 2014. www.forbes.com/sites/reuvencohen/2012/11/15/how-cloud-computing-helped-obama-win-the-presidential-election.

Cook, Gary. 2014. *Clicking Green: How Companies are Creating the Green Internet*. April. Accessed October 25, 2014. http://www.greenpeace.org/usa/global/usa/planet3/pdfs/clickingclean.pdf.

Cushing, Ellen. 2013. "Amazon Mechanical Turk: The Digital Sweatshop." *UTNE Reader*. Accessed October 27, 2014. www.utne.com/science-technology/amazon-mechanical-turk-zm0z13jfzlin.aspx.

Dignan, Larry, 2011a. Cloud Computing's Real Creative Destruction May be the IT Workforce. *ZDNet*. October 24. Accessed October 26, 2014. http://www.zdnet.com/blog/btl/cloud-computings-real-creative-destruction-may-be-the-it-workforce/61581.

Dignan, Larry. 2011b. Analytics in 40 Years: Machines will Kick Human Managers to the Curb. *ZDNet*. October 18. Accessed October 26, 2014. http://www.zdnet.com/blog/btl/analytics-in-40-years-machines-will-kick-human-managers-to-the-curb/61092.

Ewing, Jack. 2013. Amazon Labor Relations under Scrutiny in Germany. *New York Times*. Accessed October 27, 2014. www.nytimes.com/2013/03/04/business/global/amazons-labor-relations-under-scrutiny-in-germany.html.

Frey, Carl Benedikt and Osborne, Michael A. 2013. *The Future of Employment: How Susceptible are Jobs to Computerisation?* Oxford University. September. Accessed October 27, 2014. http://www.oxfordmartin.ox.ac.uk/publications/view/1314.

Frost & Sullivan. 2012. *How Cloud Computing can Reduce Supply Chain Risks*. Accessed October 27, 2014. http://www.cfoinnovation.com/white-paper/5541/how-cloud -computing-can-reduce-supply-chain-risks.

Gerovitch, Slava. 2010. The Cybernetic Scare and the Origins of the Internet. *Baltic Worlds*. Accessed October 27, 2014. http://balticworlds.com/the-cybernetics-scare -and-the-origins-of-the-internet.

Goldstein, Matthew, Perlroth, Nicole, and Sanger, David E. 2014. Hackers' Attack Cracked10 Financial Firms in Major Assault. *New York Times*. October 3, Accessed October 25, 2014. http://nyti.ms/1to7tnX.

Greenhouse, Steven. 2013. Tackling Concerns of Independent Workers. *New York Times*. Accessed October 27, 2014. www.nytimes.com/2013/03/24/business/freelancers -union-tackles-concerns-of-independent-workers.html.

Hardy, Quentin. 2014. Alibaba has a Computing Cloud, and It's Growing, Too. *The New York Times*, August 4, Accessed October 25, 2014. http://nyti.ms/1srRPLh.

Head, Simon. 2014. Worse than Walmart: Amazon's Sick Brutality and Secret History of Ruthlessly Intimidating Workers. *Salon*. February 23. Accessed October 27, 2014. http://bit.ly/1e726X6.

Hodson, Hal. 2013. "Crowdsourcing Grows Up as Online Workers Unite." *New Scientist*. Accessed October 27, 2014. www.newscientist.com/article/mg21729036.200 -crowdsourcing-grows-up-as-online-workers-unite.html.

Hoover, J. Nicholas. 2012. "6 Ways Amazon Helped Obama Win." *InformationWeek*. Accessed October 25, 2014. www.informationweek.com/government/cloud-saas/6 -ways-amazon-cloud-helped-obama-win/240142268.

Howlett, Den. 2014. Exclusive: Computer Economics Study – Cloud Saves 15 Percent. *diginomica.* February 13. Accessed October 26, 2014. http://diginomica.com/2014/ 02/13/exclusive-computer-economics-study-cloud-saves/.

Huws, Ursula. 2014. *Labor in the Global Digital Economy: The Cybertariat Comes of Age*. New York: Monthly Review Press.

Ipeirotis, Panos. 2013. "Mechanical Turk: Now with 40.92% Spam." *A Computer Scientist in a Business School*. Accessed October 27, 2014. www.behind-the-enemy-lines.com/ 2010/12/mechanical-turk-now-with-4092-spam.html.

Manyika, James, et al. 2013. *Disruptive Technologies: Advances that will Transform Life, Business, and the Global Economy*. New York: McKinsey and Co.

Marx, Karl. 1858. *The Grundrisse: Notebook VII*. Accessed October 27, 2014 https://www .marxists.org/archive/marx/works/1857/grundrisse/ch14.htm.

Marx, Karl. 1843. *Letters from the Deutsch-Französische Jahrbücher*. Accessed October 27, 2014. https://www.marxists.org/archive/marx/works/1843/letters/43_09.htm.

McChesney, Robert W. 2013. *Digital Disconnect: How Capitalism is Turning the Internet Against Democracy*. New York: The New Press.

McKendrick, Joe. 2013. In the Rush to Cloud Computing Here's One Question Not Enough People are Asking. *Forbes*. February 19. Accessed October 26, 2014. http://onforb.es/1yCk7UY.

McKendrick, Joe. 2014. We're All Outsourcers Now, Thanks to Cloud. *Forbes*. August 11. Accessed October 26, 2014. http://onforb.es/1mBuxgp.

Medina, Eden. 2011. *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*. Cambridge, MA: MIT Press.

Mosco, Vincent. 2014. *To the Cloud: Big Data in a Turbulent World*. New York: Paradigm.

Mosco, Vincent, McKercher, Catherine and Huws, Ursula. (eds.) 2010. *Getting the Message: Communications Workers and Global Value Chains*, London: Merlin Press.

Parkhill, Douglas. F. 1966. *The Challenge of the Computer Utility*. Reading, MA: Addison-Wesley.

Schuman, Michael. 2013. "Marx's Revenge: How Class Struggle Is Shaping the World." *Time*. Accessed October 27, 2014. http://business.time.com/2013/03/25/marxs-revenge-how-class-struggle-is-shaping-the-world.

Silverman, Rachel Emma. 2013. Tracking Sensors Invade the Workplace. *Wall Street Journal*. March 7. Accessed October 27, 2013. http://online.wsj.com/articles/SB10001424127887324034804578344303429080678.

Stevens, Andrew. 2014. *Call Centers and the Global Division of Labor*. New York: Routledge.

Wilson, James, and Jopson, Barney. 2013. "Amazon Hit by Old World Strike Action." *Financial Times*. Accessed October 27, 2014. www.ft.com/intl/cms/s/0/e4d3bdde-bc82-11e2-9519-00144feab7de.html.

Wingfield, Nick, and Eddy, Melissa. 2013. In Germany, Union Culture Clashes with Amazon's Labor Practices. *New York Times*. Accessed October 27, 2014. www.nytimes.com/2013/08/05/business/workers-of-amazon-divergent.html.

World Economic Forum. 2012. *Global Information Technology Report*: 2012. Geneva: World Economic Forum.