# Internet and global capitalism

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"The Internet changes everything" was the over-the-top mantra of the 1990s dot-com boom, easily critiqued in light of the subsequent bust in the early 2000s. Twenty years later, a similar refrain can be heard from the top executives of technology corporations like Google and Facebook and seen in initiatives to apply information and communication technologies to everything from the complex problem of international development to more mundane matters like catching a cab or finding a parking spot. While not wishing to characterize such simplistic sloganeering as truly visionary, it is important to recognize that there are now few corners of our social, economic, and political structures (at least in the industrialized world) that remain untouched by the Internet and its associated technologies. Computer networks, powerful digital devices, and integrated databases are now deeply embedded in the products and daily practices of the global economy.

This entry reviews this complex intertwining of information technologies and the more conventional material geographies of the global economy. We seek to provide some answers to the questions of how the geographies of global capitalism have shaped the Internet and how the Internet has reshaped the geographies of global capitalism. Clearly it is not enough to simply assert that everything (or nothing) has changed; instead we must understand the nature of changes in the space economy, how these changes came about, where and to whom power and wealth has shifted, and how new products, organizations, and spaces in the global economy are emerging thanks to the availability of the Internet and digital technologies.

## The informational infrastructures of the global economy

During the commercialization and rapid diffusion of the Internet in the early 1990s, techno-utopian visions abounded: workforces freed from the constraints of co-presence by the power of telecommuting; the decline of cities as agglomeration economies became less relevant; and, most famously, the "death of distance" as the Internet provided constant connectivity (cf. Cairncross 1997). These visions were, at their core, technologically determinist, predicting uniform and massive upheaval in long-standing social and spatial structures with little regard to the complex ways the Internet could be put to work in the economy. Not surprisingly, the reality that emerged was much different and considerably more complex than these simplistic visions.

A key reason behind this is that the Internet is grounded in particular places through the massive, albeit often unseen, network of material infrastructure necessary to support its existence, from fiber-optic cables spanning the continents

*The International Encyclopedia of Geography*.
Edited by Douglas Richardson, Noel Castree, Michael F. Goodchild, Audrey Kobayashi, Weidong Liu, and Richard A. Marston.

DOI: 10.1002/9781118786352.wbieg0609

and oceans to so-called server farms located in peripheral locations, which house all of the data we generate and store "in the cloud." Despite widespread visions of ubiquitous connectivity, access to the Internet has remained stubbornly uneven, from the local scale to the national and supernational scales, due to the "splintering" effect engendered by Internet infrastructures (Graham and Marvin 2001; Malecki 2002). This splintering has meant that rather than the predicted universal access to the Internet, some places (particularly urban areas) have become quite well connected, while other nearby places remain practically off the map.

The tendency for informational infrastructures to cluster together in relatively dense places has ultimately meant that the geography of the Internet has often reinforced existing patterns of urbanization and agglomeration, rather than overturning them. Using a range of metrics – from bandwidth measures, points of presence, and domain name registrations, among other things – early geographers of the Internet demonstrated that the then-emerging information economy was not somehow separate from other sectors of the economy and their geographic influences (Townsend 2001; Zook 2000). This work highlighted the importance both of a handful of key "global cities" like New York which were at the center of the global network, and of long-standing national powers, such as the United States. Although the United States retains a powerful place within the landscape of Internet connectivity and governance, its centrality has diminished somewhat in more recent years. For example, it was recently announced that the US Commerce Department would cede its control over the Internet Corporation for Assigned Names and Numbers (ICANN), the body responsible for governing the domain name registration system, to the international community.

As has been the case with the United States' role, these patterns of continuity, however, have also been accompanied by reconfiguration of urban hierarchies tied to Internet infrastructure. Some cities, such as Washington, DC, San Francisco, and Seattle, have benefited economically during the last two decades due to their positioning as transoceanic cable landings (Townsend 2001). While New York remains the most significant city in this respect, due largely to its direct connections with Europe, these other cities have encroached on the status of America's more conventional global cities such as Chicago and Los Angeles. The groundedness of this infrastructure in particular places, however, also leads to potential for disruptions. While targeted terrorist attacks on critical infrastructure (Roberts, Secor, and Zook 2012) or disruptions to global financial markets caused by earthquakes or other natural disasters tend to preoccupy some, much more straightforward and mundane disruptions are also possible. For example, the ability of the Egyptian government to simply "switch off" the country's Internet during the Arab Spring protests in 2011 due to the centralization of the country's global connections in a single government-owned building, or the case of a Georgian woman scavenging for copper who sliced through a cable and disconnected 90% of Armenia's Internet, highlight the importance of these material manifestations to this supposedly virtual domain or global capitalism.

Infrastructure alone is rarely enough as the immaterial knowledge infrastructures present in urban centers – often built around existing industries or capabilities – have also proven key in the reordering of these economic hierarchies. For example, Zook (2000) has shown that places like San Francisco and the Bay Area in California, Provo, Utah, Portland, Oregon, Austin, Texas, and Las Vegas, Nevada, emerged as relatively specialized centers of Internet content

production, while a handful of cities in Florida have become well known for their specialization in the Internet adult industry. While the reasons behind this clustering are complex and many – indeed, not all places can develop such clusters – these particular urban nodes have succeeded by leveraging existing local economic activities such as software development and gambling onto the Internet. More contemporary data show that specific slices of informational activity are concentrated unevenly and sometimes in somewhat unexpected ways. A case in point is that the Tokyo metropolitan region retains its centrality in terms of user-generated Google Maps content, but has been surpassed, along with New York and London, by Jakarta, Indonesia, in tweeting activity. So while the particular places privileged by the Internet's geography may not accord precisely with rankings of global cities or other expectations about the distribution of economic power and resources, larger scale social and economic processes, such as geographically uneven development, have been intensified by the Internet, rather than eliminated.

## Digital commodities and consumption channels

While the Internet has contributed to the restructuring of global urban hierarchies, perhaps the greatest impact has been on the (re)organization of the economy. This is most evident in creating space for new kinds of products and services which are either wholly digital or which rely upon the Internet to facilitate the consumption of particular offline goods or services. This includes digital versions of previously material items such as music or movies, and inherently digital commodities for use in gaming or virtual worlds like Second Life and World of Warcraft, as well as novel services like eBay or AirBnB, which redirect consumption patterns, or social media platforms focused on the production, capture, and exchange of user-generated information.

A commonality across new digital products is that the Internet has made it ever more difficult to exclude access to them; perfect copies can easily be made and distributed for simultaneous use by multiple individuals across great distances. While more conventional business models of the twentieth century were predicated on the excludability and rivalrous nature of consumer products, the Internet has largely turned digitized products, such as music, into both a nonexclusive and nonrivalrous good (cf. Leyshon 2001). This has led to significant disputes over intellectual property rights with a spiraling set of technologies and counter-technologies competing to permit or prevent copyright holders from making digital commodities into excludable and rivalrous goods. In parallel, new businesses, such as Google and Spotify, have emerged in which consumers no longer pay directly for digital products with money, but do so by forfeiting the right to data about themselves and their online interactions, which is then used to serve targeted advertisements to these potential consumers. The growing importance of social data as a product for resale has led to a growth in user-generated content through websites like Facebook, Twitter, Flickr, and Instagram, which all are free for users, but which for commercial viability also rely on the sale of data generated by these users to third parties.

In addition to new digital products, the Internet has engendered novel ways of channeling consumption through a range of digital services. Though the aforementioned social media platforms have been important commercial actors in their own right, other platforms attempt to more directly tie the virtual world of the Internet and social media to the material world, especially

through consumption. While Google Maps provides spatial search and wayfinding services, its algorithms also have the potential to "re-route" users to particular kinds of locations based on a number of more-or-less opaque factors, perhaps leaving some places undiscovered by anyone without deep, place-based knowledge (Zook and Graham 2007). Similarly, Foursquare provides social and monetary incentives for individuals to record and annotate their daily spatial practices of consumption, such as the offer of a discount for habitually "checking-in" at one's favorite coffee shop. One important recent development is Facebook's purchase of Oculus VR, a maker of virtual reality headsets most commonly used for gaming. This investment of $2 billion is indicative of the importance of linking these virtual experiences and interactions to the material world and everyday life. As Facebook notes in their press release about acquiring Oculus, "virtual reality technology is a strong candidate to emerge as the next social and communications platform," highlighting the centrality of digital mediation to consumption in the economy.

The impact of the Internet on consumption is not limited to these highly visible examples, however. Indeed, online retail, or "e-tailing" as it was referred to in its early manifestations, is transformational precisely in so far as it has receded from our view and seamlessly melded into the daily routines of so many individuals. From online travel websites such as Expedia and Priceline to multipurpose retailing websites such as Amazon, consumers now have easy access to a wide variety of products via quick shipping options. Brick and mortar stores remain, but online consumption channels are solidly established in our economies. Moreover, some of these channels have introduced new ways of widely distributing material products at reduced volumes making smaller scale operations commercially viable. This can be seen in the growth of new sales channels such as the craft website Etsy, in which artists and artisans can access new and distant markets, or AirBnB, which allows one to rent out one's home as if it were a hotel room. In short, the Internet has enabled a range of new products, services, and pathways for consumption to emerge within the economy.

## Internet-enabled changes in labor geographies

Alongside these new products and services have come important changes in the practices and geographies of labor. Initially, the preoccupation with the Internet's effects on work and labor tended to focus on two key ideas. First was the notion that the introduction of new ICTs would necessarily lead to the deskilling of labor and loss of jobs, as computers automated many routine tasks performed by unskilled information processing workers. The second important idea was the now somewhat mundane notion of "telecommuting" or the ability of workers to work from home due to the remote accessibility enabled by an Internet connection. In other words, the Internet was expected to render co-presence obsolete, as companies and workers alike could save time and money, avoiding lengthy commutes, unnecessary capital outlays for office space, or other things by communicating online. While there has been deskilling and telecommuting, the Internet's effects on labor and its geographies are much more complex. New forms and definitions of labor have emerged alongside deskilling, while spatial practices of labor have evolved to take advantage of these emerging forms of work and organization.

One of the key shifts associated with Internet-enabled labor practices has been the emergence of crowdsourcing, or a kind of

"volunteered" labor associated with the production of user-generated content without financial compensation. Ritzer and Jurgenson (2010) identify this process as the rise of "prosumption" on the Internet, or the increasing tendency for production and consumption of online information to be indistinguishable, occurring simultaneously. They argue that this process is characterized not only by free labor and free products, but also by an economy of abundance, rather than scarcity. They point to the potential for prosumption to act as an alternative to conventional capitalist social relations, especially around the control of exploitation of labor by capital. Rey (2012) furthers this argument, likening Facebook to Marx's factories as the key site of exploitation under informational capitalism, whereby capitalists extract surplus value from the unpaid labor of Facebook users.

While the prevalence of unpaid labor is increasingly important for an economy where information is a primary commodity, the Internet also has allowed for the expansion of systems of paid informational labor outside of more conventional employment relationships. One of the key examples of this is the rise of "microwork," such as that offered by Amazon's Mechanical Turk service. This platform connects employers with workers for short-term information processing tasks, such as identifying typos in a sentence or comparing the objects in a set of images, which tend to pay just one or two cents per task. Despite the low average pay of $2.30 an hour – enabled by Amazon's classification of workers as independent contractors – 15% of the Mechanical Turk workers living in the United States (which accounted for 56% of the global Mechanical Turk workforce in 2009) rely upon this income "sometimes or always" in order "to make basic ends meet" (Ross *et al.* 2010).

Alongside informational microwork, there is the process of offshoring, or the outsourcing of jobs from developed economies to developing countries in order to profit from decreased labor costs and lower burdens of government regulation. While often discussed in terms of manufacturing employment, a number of informational occupations, including call centers and customer service, also have been affected (Gereffi 2006). While offshoring of routine and even skilled informational jobs is ongoing, Zook and Samers (2010) argue that the geographies of outsourcing are also taking the form of "nearshoring," "onshoring," or "homeshoring," indications that although the Internet can allow for coordination and communication across great distances, social relations remain incredibly place bound, whether by language or cultural similarities, affecting a business's wellbeing. For instance, countries such as India, the Philippines, and South Africa have all emerged as key localities for call center outsourcing catering to English-speaking countries, while Spanish-speaking call centers tend to locate in Latin America, and German-language call centers in Turkey.

In short, it is important to embed these changes within broader histories and cultural specificities that create a significant amount of internal differentiation between places. While the reduction in labor costs remains an important consideration for firms wishing to outsource any type of job, there is no single set of criteria by which these decisions are made, with different locations offering a variety of advantages depending on their particular relationships with other spatially distant locations. Similarly, just as no places are affected in the same way by these structural changes, the kinds of changes wrought by the Internet do not apply equally to all kinds of labor. While some jobs have been entirely automated by computers, outsourced to other countries or continents, or broken into a series of microtasks, other opportunities have emerged, particularly for what Castells (1996)

characterizes as self-programmable labor, where workers are able to quickly adapt to volatile employment opportunities.

## New forms of manufacturing in the Internet era

The influence of the Internet on labor practices is not confined to the use and dissemination of information. The Internet also has important impacts on how material goods are produced. From robotics to computer-aided design (CAD), enabling designs to be produced in one location and easily transferred to computer numerical control (CNC) tools in another, the Internet has altered the kinds of work performed in manufacturing material goods, providing an important role for information processing and transfer even in this sector. CNC systems are central to flexible manufacturing, permitting the creation of "reconfigurable manufacturing systems" which "allow adding, removing, or modifying specific process capabilities, controls, software, or machine structure to adjust production capacity in response to changing market demands or technologies" (Mehrabi, Ulsoy, and Koren 2000, 404).

These techniques of flexible manufacturing have further evolved with the growth of 3-D printing technologies in which solid objects based on CAD specifications are created by precisely depositing material – often a plastic but potentially metals or other materials – in a series of layers, a feature that is particularly useful in prototyping. While traditional mass production techniques produce lower cost (and generally higher quality) products, 3-D printing is beginning to be used by a range of corporations and likely will become even more useful as the technology advances to include the ability to print electrical circuits directly into objects.

While the high costs of 3-D printing remain its greatest challenge, some business scholars highlight its potential to support a range of "mobile manufacturing" strategies (Stillström and Jackson 2007, 188). For example, the start-up company Mebotics has developed a desktop system which is marketed as "the world's first machine shop in a box." One of the founders of the company sketches out a scenario of being in a remote location but needing a spare part; access to a 3-D printing system and the Internet would allow the user to acquire printing specifications and create a replacement part. Proponents of 3-D printing, moreover, argue that normal consumers, even with access to standard retail outlets, will eventually find it economical to print out a range of simple consumer products using open-source CAD files for objects at online repositories.

The necessity of CAD files (open source or proprietary) highlights ongoing concerns about intellectual property that are associated with the Internet. Just as the music industry lost the ability to monetize product through physical media (records, CDs) as digital files enabled perfect copies of music, manufactured goods could face the same threat. Once CAD source files are available on the Internet, then anyone with a 3-D printer could create a material copy. One could easily imagine groups of activists creating high quality CAD files of desirable (yet proprietary) goods – jewelry, silverware, and so on – and making them available via bit torrent systems – much in the same way that copyrighted videos are currently shared – to create open (albeit illegal) production of material goods. This potential strikes directly at a range of design and creativity-based economies and economic development policies; if design-intensive items can be scanned and available to anyone to download, this potentially threatens the value

that designers and corporations can capture (as in the recording industry).

## Transformation of finance and logistics

The Internet has been equally important in introducing new spatial and organizational dynamics into service industries such as finance and logistics. While one focuses on money flows and the other on material goods, both are fundamentally dependent on the flows of information through the material infrastructures of the Internet.

### Finance

In many ways, the financial sector has been the area of the economy most fundamentally impacted by the growth of the Internet and other digital technologies. Indeed, it was the intertwining of the Internet and finance that led to early pronouncements of the "end of geography," (O'Brien 1992). Not only has finance grown to become one of the most important parts of the global economy, but it also has begun to shift away from its historical function of providing capital investments for new business or trade ventures. The financial sector has increasingly focused on the trading of a range of complex financial instruments or derivatives that are loosely, if at all, connected to material assets or the competitive prospects of a given firm.

The Internet and associated information technologies underlie many of these new products and practices, as they could simply not exist to any meaningful extent without computers and standardized global communication networks. Like the Internet's intertwining in other processes, the importance of these technologies is often hidden from view for all but those experts who experience these practices directly. For example, one of the key mechanisms contributing to the 2008 financial crisis were instruments known as collateralized debt obligations (CDOs), which combined hundreds of income streams deriving from hundreds or thousands of home mortgages. Each income stream did not represent an entire mortgage but instead was a slice or tranche of the payment prorated in various ways. More expensive tranches were drawn from lower risk mortgages and/or were guaranteed first payment rights. The goal and claim of makers of these CDOs was that this provided a reliable way to mitigate risk, but events quickly proved that complexity was no barrier to financial hazard. While dividing, bundling, and sharing risk is a long-standing and important practice within the financial sector, the sheer magnitude of these practices associated with the mortgage crisis was only possible with digital technologies that are seemingly able to make risk disappear.

The financial industry has also developed new practices that fundamentally rely on the Internet. For example, during the past 20 years trading at stock exchanges has shifted from actual trading floors to server farms in which computer algorithms conduct tens of thousands of trades every second. This phenomenon, known as high-frequency trading (HFT), works to compress time–space at very small scales (milliseconds and microns) to construct informational advantages vis-à-vis other traders. One of the key techniques used in HFT is to identify small price differences in pricing for the same or similar stocks in different (and physically distant) trading venues. With this information, trading algorithms execute buy and sell orders across hundreds of kilometers via an increasingly sophisticated array of networks. This has involved the laying of new fiber-optic networks between major trading centers, such as between Chicago and New York, as well as setting up a series of microwave and laser transmitters, simply in order

to ensure that an HFT buy or sell order arrives a few thousandths of a second before those of one's competitors (MacKenzie *et al.* 2012).

While HFT tends to be out of view for most individuals, a more common way that the Internet has influenced finance is through the emergence of virtual currencies associated with virtual worlds and online social networks, such as Linden Dollars in Second Life or the attempt to create a completely decentralized currency, Bitcoin. While these currencies currently suffer from issues of stability, liquidity, and uncertainty of legal obligations, they offer an intriguing glimpse of what may be possible in a global information economy in which software and networks allow global collections of users (versus states or large financial firms) to literally create money. Equally interesting are the political values associated with these currencies; in the case of Bitcoin a type of algorithmic libertarianism poses behind a stance of apolitical objectivism. Whether the specific Bitcoin project succeeds or not is less relevant than the individualization of empowerment – the ability to design or manipulate software (either directly or via proxy) – that allows some individual actors to undertake political and economic projects at scales and scopes that previously were not possible. In short, the power of the networked individual is a fundamental characteristic of global capitalism in the age of the Internet.

## Logistics and global production networks

The virtual spaces of the Internet have become more and more intertwined with the flow of material goods around the globe. Just as the near-instantaneous global information flow has allowed for high-frequency trading and other new financial products, these same informational infrastructures are put to use in tracking and changing the way material products move through space on a global scale (Coe, Dicken, and Hess 2008).

While spatial structures in the economy have long been driven by transportation networks and population, new IT-enabled logistics has allowed for new forms of competitive advantage for firms and localities across the globe, with firms increasingly outsourcing their logistics operations to specialized third-party logistics providers who concentrate on the collection and analysis of information about products, rather than on their design and manufacture. Rather than focusing on building competitive advantage solely within the production process, new logistics services allow firms to reduce the cost of moving goods and maintaining inventory, as pioneered by the just-in-time manufacturing systems of Toyota, or the cross-docking restocking of the American retail chain Walmart.

With easily accessible information and the ability to reroute flows of goods relatively easily, inputs for products or final goods can be "stored in transit" rather than warehoused, thus reducing the necessary capital outlays for production or retail stocks. The augmentation of these material products and the vehicles on which they move with radio-frequency identification (RFID) chips and global positioning systems (GPS) receivers allow for individualized tracking of products, even across great distances. This facilitates the further spatial extension of supply chains, as important factors such as trust and tacit knowledge become codified through digital information. It has been argued that contemporary Internet-enabled logistics services represent an unprecedented merging of transportation and information industries, making the movement of material goods through space a virtual phenomenon as much as a material one (Aoyama and Ratick 2007).

The digital augmentation of supply chains can also be produced through new forms of

infrastructural systems. Space-constrained ports can use their knowledge of distanciated supply chains to better manage the flow of goods in and out of the port, increasing the efficiency of transportation. As one IBM promotional video on the baggage handling system at Amsterdam Airport states, "We can't make the airport bigger. The physical footprint is limited by highways, cities and villages. We must make more capacity available by making the system smarter … the intelligent software creates space where there was no space before." Although couched in advertising rhetoric, this quote is indicative of the broader trend of using information flows to overcome the constraints of existing physical infrastructures.

While the use of the Internet in managing supply chains has stretched economic relations across greater social and spatial distances, it has not eliminated the massive inequalities that exist within the global economy. For example, Graham (2011) has shown that despite the expectations for the Internet disintermediating supply chains, that is, allowing for more direct relationships between producers and consumers, evidence suggests that there is little change in the organization of many sectors, at least not in such a way as to alter more macro-level development outcomes. Moreover, examining small-scale manufacturers in Tanzania (which enjoy widespread use of information and communication technologies), Murphy (2013) shows that the benefits of these technologies tend to accrue primarily to extra-local actors who are already situated in dominant positions relative to local-scale businesspeople. That is, the Internet may offer the means for economic exploitation of marginal places and places in the information age, even as it opens up significant opportunities for others (Ya'u 2004). Even the production of commodities emblematic of the information economy, such as the iPhone, tends to reinforce these patterns. While the iPhone's supply chain is truly global, with manufacture of the phone alone stretching across China, South Korea, and Germany, most of the value produced in the process of creating the several-hundred-dollar device is captured by designers located at Apple's headquarters in California, not by workers assembling the devices. So while Internet-enabled logistics are reshaping parts of the sociospatial system, this seems to have done little to alter the fundamental economic structures that influence everyday life in the Global South (Carmody 2012).

## Conclusion

The Internet has undoubtedly played an important role in the evolution of global capitalism over the last two decades. While the changes are significant, they are best characterized as a reconfiguration or intensification of existing structures and processes, rather than a wholesale creation of new forms of economic organization that are somehow qualitatively distinct from previous eras. The examples outlined here highlight the complex and contradictory role of the Internet in reconfiguring flows of products, labor, and capital in the global economy. New products and consumption channels have emerged just as labor and production practices have evolved in response to the availability of the Internet, bridging the seeming divide between the virtual and material.

The Internet has facilitated new uses for old spaces and enabled new forms of capital investment, from fiber-optic cable infrastructure to high-frequency trading to the commodification of personal data. Ultimately, the sociospatial reconfigurations of the global economy wrought by global networks of information technologies are remolding the terrain on which capitalism operates. While this has brought many changes

to our everyday lives and to the processes through which the economy is constructed, capitalism remains the dominant form of economic organization worldwide, even in the age of the Internet and notwithstanding the notion that the Internet supposedly changes "*everything*."

**SEE ALSO:** Digital divide; Information and communications technology; Information technology and mobility; Local/global production systems; Logistics

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