Chapter 5
Cloud Collaboration: Peer-Production and the Engineering of the internet

Mark Graham

> *cyberspace is real*
> –President Barak Obama (2009)

5.1 Introduction

Many of the megaengineering projects constructed throughout human history have left us with immense and spectacular features on the Earth's landscape. The Egyptian pyramids, the Great Wall of China, the Panama Canal and Burj Dubai all offer visually unforgettable reminders of the feats that can be accomplished by the concerted efforts of thousands of laborers (c.f. Edwards, 1985; McCullough, 1977; Verner, 2001).

The element that all of these engineering projects have in common is the convergence of thousands of laborers in specific moments in space and time. However, with the onset of the Computer Age, an epochal shift in the ways that the fruits of labor can be combined has taken place. Widespread access to Information and Communication Technologies (ICTs) and agile and adaptable systems of workflow now allow people across the globe to collaborate on virtual mega-engineering projects that are unprecedented in scale or scope.

Ten or even hundreds of thousands of workers are now able to combine their efforts to create virtual projects that are less visible (from the physical world), but no less ambitious than their material counterparts. *Wikipedia,* for example, currently (in mid-2009) has 75,000 active contributors working on ten million encyclopedia articles in 260 languages (*Wikipedia: The Free Encyclopedia*, 2009). YouTube, the popular video sharing website, now hosts approximately 100 million videos, created and uploaded by hundreds of thousands of people. Perhaps even more astoundingly,

M. Graham (✉)
Oxford Internet Institute, University of Oxford, Oxford, UK
e-mail: immedium@gmail.com

200 million people have now uploaded text, hyperlinks, photographs and videos to a Facebook profile.

Such amalgamations of the combined efforts of so many people in distinct moments in time and space are simply unprecedented in human history. This fact has not gone unnoticed by social commentators, and there are few remaining large organizations or companies that have not attempted to use the internet to harness the work of segments of the connected global labor force. Indeed, in 2006, the millions of creators of user-generated content on the were awarded *Time* magazine's Person of the Year award (Fig. 5.1), with the editor arguing that Web 2.0 (or the technological frameworks for bringing together the contributions of millions of people) represents nothing short of a revolution because it is no longer "the few, the powerful and the famous who shape our collective destiny as a species" (Grossman, 2006).

This chapter begins by reviewing these new ways of organizing labor, focusing on the variety of forms that cyberprojects can take. The chapter then discusses the very properties of the internet that allow people from around the world to "come together" and construct projects using the internet. Finally, the chapter concludes by

Fig. 5.1 My/our/your time person of the year award. (Source: Wikipedia.org)

examining whether Web 2.0 projects signal the beginnings of open and democratic cyberspaces, or if they instead represent new forms of exploitation.

5.2 Construction in the Cloud

Not since Marx identified the manufacturing plants of Manchester as the blueprint for the new capitalist society has there been a deeper transformation of the fundamentals of our social life. As political, economic, and social systems transform themselves into distributed networks, a new human dynamic is emerging: peer to peer (P2P).

(Bauwens, 2005)

The defining feature of the enormous projects being constructed through the internet is the fact that they are being engineered by labor forces that engage in non-proximate and distributed collaboration. While this phenomenon is both new and unprecedented in human history, it has already been labeled with an assortment of terms: "crowdsourcing," "cloudsourcing," "user-generated content," "peer-to-peer collaboration," and "Web 2.0." However, I would argue that the term that best encapsulates the dynamics of this distributed, decentralized, and largely volunteer workforce is "cloud collaboration." The metaphor of a cloud is a useful way to refer to the spatiality and the topologies of the internet. The cloud can be seen and moved through, but is not a place that we could ever inhabit. The cloud also represents the totality of cyberspace: a space that certainly exists, but is difficult to draw clear boundaries around (Scanlon & Wieners, 1999).

Before examining in more detail the ways that cloud collaboration is structured, it is useful to discuss exactly what is being created. Non-proximate labor forces have been organized to create impressive feats of engineering before. Indeed, it could be argued that most of the products created by transnational corporations (TNCs) in the world today are created by vast workforces of non-proximate laborers. It is, therefore, important to distinguish between engineering projects that create outputs that are plural in nature (e.g. projects run by TNCs like Airbus, Apple or Toyota that exert most of their efforts building thousands (or even millions) of copies of each product), and those that create outputs that are singular in nature and are rooted to one physical or virtual place (i.e., in these cases, a majority of effort is spent designing and creating the project rather than creating copies of it). It is the latter form of virtual project that this chapter explicitly focuses.

Considering convergence in both time and space is crucial to understanding how projects created through cloud-collaboration contrast to other large engineering projects (Fig. 5.2). Most megaengineering projects that have been constructed have required laborers to converge in both time and space. The Egyptian pyramids or the Three Gorges Dam could not have been built if workers reported to the construction sites whenever they chose to and stayed at work for as long as they wanted to. Similarly, while the workforces of a TNC may not all converge in space, they do come together in time. Jet planes, iPods, pickup trucks, and every other product made by a TNC could never be efficiently put together if workers did not report to factories at designated times. However, with the projects created by

Fig. 5.2 Time and space
convergence in various types
of large engineering projects.
(Source: author)
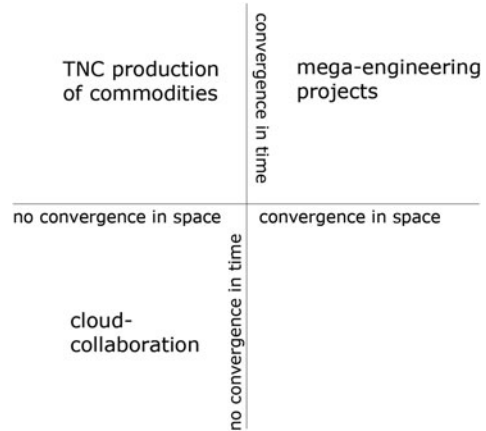
cloud-collaboration there is rarely any push for workers to report to duty at specific times. Web 2.0 content is not hosted in any one centralized place, but is rather stored in distributed servers that can be accessed from anywhere with an internet connection. Contributors therefore generally work whenever they want and for as long as they want.

It is also important to distinguish between projects created *on* the internet and projects created *through* the internet. Many of attempts to harness cloud collaboration focus on the latter type of project, and almost always have concentrated on building computer software. One of the most well known examples is the Free Software Foundation (FSF), which has a stated goal of ultimately making software freely available for all computer users.[1] These projects work by bringing together the expertise of people around the world to participate on different aspects of the same piece of software.[2]

While the ability of groups like the FSF to bring together thousands of workers through the internet is certainly an impressive feat,[3] their outputs pale in comparison to user-generated content being created and organized in the cloud rather than through it. A variety of forms of collaboration exist which bring together thousands of workers to construct projects in the same cyberplaces. The range of types of collaboration can be generally classified into three types, although there are naturally examples of overlap between categories (Table 5.1).

5.2.1 Social Spaces

This category refers to the enormous social forums that have been built in recent years. Online social forums exist in a variety of guises, but primarily serve to facilitate some form of social networking. In some social spaces, contributors are expected to upload personal information including text, pictures, sounds and videos. This information is then brought into the same virtual networked space as the

Table 5.1 Examples of projects that make use of cloud collaboration

Social spaces		Content spaces		Cosmographies	
World databases of people brought into the same social spaces.		Spaces in which knowledge is brought together about specific subjects.		Representations of the physical world in cyberspace using the Earth as an organizing principle.	
Project	*Description*	*Project*	*Description*	*Project*	*Description*
Facebook	Social networking	Flikr	Photo sharing	Bing Maps	Web mapping
Linkedin	Business networking	WikiAnswers	Questions and answers	Google Earth	Virtual globe
Match.com	Partner search	Wikichains	Ethical consumption	OpenStreetMap	Street map
Second Life	Virtual world/social networking	Wikipedia	Encyclopedia	WikiMapia	Virtual globe
Warcraft	MMORPG	YouTube	Video sharing	Wikipedia	Global travel guide

Source: author

information provided by each contributor's family, friends, and colleagues. These have in many ways turned into a giant database of a significant portion of the world's population. For instance, 200 million people have contributed information to Facebook (a social networking site), over 100 million have uploaded content to MySpace (another social networking website), and 15 million people have provided information to Match.com (an internet dating website).

Other social spaces focus less on creating a database, and more on facilitating or bringing into being spaces in which social interaction can occur. The precursors to the large social spaces that exist in cyberspace today were chatrooms and internet forums, with distributed contributors providing the bulk of content. This is not to imply that chat rooms are a thing of the past. They have steadily grown in size, and some such as the Japan-based 2channel now have millions of new posts every day. However it is the massively multiplayer online role-playing games (MMORPGs) that perhaps provide the best examples of spaces being created through cloud collaboration. World of Warcraft, for example, currently has 11.5 million subscribers; each of whom designs an avatar and interacts with other subscribers in an online universe. Second Life is an even more interesting example of a social space created through cloud collaboration. Any of the 15 million users can build virtual objects, own virtual land, buy and sell virtual goods, attend virtual concerts, bars, weddings, and churches, and communicate with any other member of the virtual world (Fig. 5.3). Second Life has become so popular that a variety of institutions based in the physical world have purchased virtual land within the virtual environment[4] (e.g. Sweden, Israel, and the Maldives have established embassies, and the British Council, Goethe Institute, and Cervantes Institute have constructed virtual schools in Second Life).

Fig. 5.3 Avatars in second life. (Source: http://www.flickr.com/photos/lindenlab/2551390368/in/set-72157605197609174/)

Users of Second Life create almost every aspect of the virtual world and, as a result, a relatively complex society and economy has developed (Boellstorff, 2008).

5.2.2 Content Spaces

Content spaces are locations on the internet that bring together large amounts of media. Users are both producers and consumers (prosumers) in these spaces (Ritzer, 2009). The most well known example of is YouTube, a video-sharing website onto which 100 million videos have been contributed by thousands of people. Twenty hours of videos are now uploaded by users to the site every single minute of the day (this is the equivalent of 86,000 full-length films being released each week) (YouTube, 2009). Other examples include Scribd, a document-sharing site onto which 50,000 documents are uploaded every day, and Flikr, a photo-sharing site that now contains over 3 billion images uploaded by users.

   Many content spaces employ the wiki model of collaboration. A wiki is a website that allows anyone to add, modify, or delete content. Some of the most important websites in this category are Wikipedia[5] (by far the largest encyclopedia ever put together with 12 million articles in 262 languages), WikiAnswers (a site containing 9 million questions and 3 million user submitted answers), and Baidu Baike (the largest Chinese-language encyclopedia containing 1.5 million articles). The largest wikis impose few restrictions on the scope of their projects. Almost any question can be asked on WikiAnswers (and it is difficult to think of any original question not already included in the 9 million that have been asked on the site. *Wikipedia* similarly aims to cover "the sum of all human knowledge" in every human language (Dodson, 2005). However, rather than allowing an unlimited scope for contributions, most wikis encourage contributors to focus on specific topics such as psychology (Psychology wiki), the production networks of commodities (WikiChains), and sensitive documents and leaks (Wikileaks).

The fact that anybody can contribute to a wiki from anywhere in the world has led to wikis being described as an exercise in both anarchy and democracy (Ciffolilli, 2003). They allow a deconstruction of monopolies on truth and grand narratives and instead encourage a move towards plural and relatively unstable little narratives. Knowledge constructed in wikis is able to take on a fluid and unfixed character in two main ways.

First, content is never considered finished or complete. Wikis always allow information to be moved altered and deleted. A static location in cyberspace (for example http://en.wikipedia.org/wiki/President) can thus display very different content at different times. Second, wikis generally do not discriminate against different types of contributors. Most wikis allow anonymous contributions, and never require contributors to submit any professional credentials. While articles can be written collaboratively by people from around the world, a core characteristic of wikis is that they necessitate agreement. Subject matter can be described and represented in only one way. For example, there is only one Wikipedia article that focuses on the Thai island of Ko Tao, while on other Web 2.0 projects (such as YouTube), the island is represented in a multitude of ways. This means that although any person can in theory comment on any subject, there are in fact distinct rules and power-relationships that influence the organization of the labor force. Disputes about visible content are a common feature of wikis, and the methods employed to resolve disputes are often opaque and favor certain segments of the online population. These issues are addressed in more detail following a brief discussion of the final category.

5.2.3 Cosmographies

While social spaces and wiki spaces bring together masses of information about the world into centralized nodes or locations on the internet that are organized around theme, person, or any other imaginable principle, cosmographies are built around the idea that the Earth itself can be used as an organizing principle. Included in this category are Google Earth/Google Maps, Yahoo! Maps, Microsoft Live Search Maps,[6] Wikipedia, WikiMapia, and OpenStreetMap.

In each of the cosmographies, the physical world is represented by contributors from around the globe. Some of the cosmographies allow multiple representations of the same place in the physical world to coexist on the internet. Figure 5.4 is an example of user-generated representations of London's Trafalgar Square in Google Maps. The website brings together the hundreds of user-generated comments, photographs, and videos of that specific part of London and allows them all to be accessed by navigating to Trafalgar Square using the Google Maps interface. Other cosmographies necessitate agreement and only allow the physical world to be represented in one way. Figure 5.5, for example, is a representation of Trafalgar Square taken from the Wikipedia website. Here, over five hundred creators of the article have to decide on how to best represent any specific part of the world.

Many of the physical and cultural characteristics of the planet have now been mapped out by the army of volunteers that contribute their time to one or more of the online cosmographies. Wikipedia has over 50,000 places represented, over
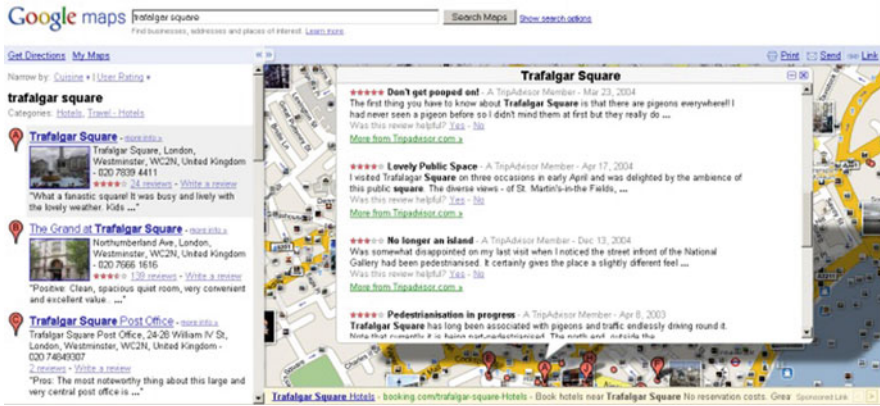
Fig. 5.4 The multiple representations of trafalgar square in google maps. (Source: maps. google.com)
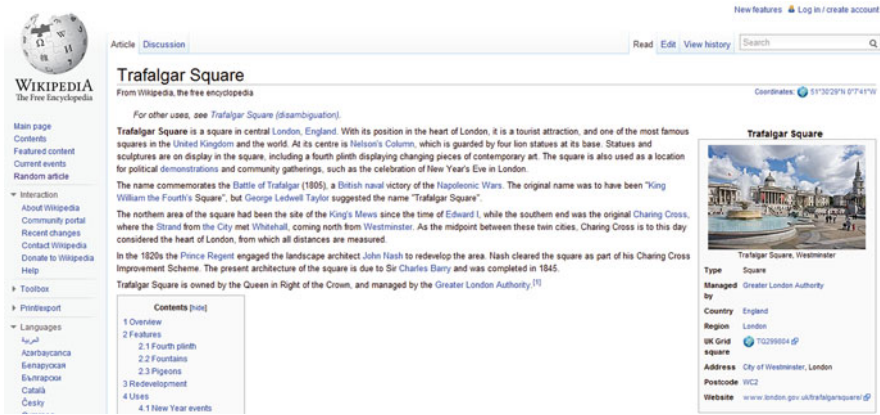

Fig. 5.5 A singular representation of trafalgar square in wikipedia. (Source: wikipedia.org)

a million page edits, and over 40.000 contributors. WikiMapia, has an even larger database of user-generated content, with over 10 million places represented in May 2009. The work behind OpenStreetMap is perhaps even more impressive. On 4 May 2009, 113,201 people had uploaded 801,461,215 GPS points into the online database. Google Earth is perhaps the most widely used member of this group, and has been downloaded 500 million times. There are now over one million members of the Google Earth community (bbs.keyhole.com), with almost 700,000 bookmarked placemarks listed on the Google Earth community page[7] and over 200 million maps created by users (Scott, 2009).

The fact that hundreds of thousands of people have been able to create millions of profiles, encyclopedia entries, and representations of the physical world has lead commentators like Kevin Kelley (2009), in *Wired* magazine, to claim that cloud collaboration marks a crucial shift in human history: a move towards a new untried

form of socialism or dot-communism (see also Barbrook, 2000). Not only can any virtual project, in theory, now be built by a labor pool of millions of people, but the outputs of that labor will also supposedly be non-hierarchical and democratized (Butler, 2006; Hall, 2007). The virtual world will be created not through top-down decision making, but instead through collaboration, participation, and transparency. It is to a more detailed analysis of these claims that the remainder of this chapter turns.

5.3 Characteristics of the Cloud

Accurately defining the distributed, decentralized, and volunteer work that is taking place through the internet is crucial to being able to formulate accurate understandings about the nature and types of projects being constructed. There is a significant amount of power embedded into the terminology and metaphors that are regularly used. For instance, it is often claimed that anybody, anywhere on the planet with the requisite hardware, software and internet connection can contribute to Web 2.0 projects like Wikipedia or OpenStreetMap; thus implying that 1.5 billion people (the current number of internet users) can potentially be brought into the same virtual construction site for any project (Beer, 2008; Breen and Forde, 2004; Goodchild, 2007; Kelley, 2005).

Eric Raymond, in a now famous essay on the collaborative software development model, compares the shared cyberspaces in which virtual construction sites are created to a bazaar (1999). Raymond thus implies that two or more collaborators inhabiting non-proximate locations in physical space are able to share more than a topological connection; they are instead seen to be occupying the same virtual space, cyberspace, or "global village" (c.f. McLuhan, 1962). Cyberspace, in this sense, is able to take on an ontic role. It becomes both an ethereal alternate dimension that is infinite and everywhere (because all potential laborers have access to it irrespective of their location in physical space) and fixed in a distinct location, albeit a non-physical one (because, despite being universally accessible, all willing participants are thought to arrive into the same virtual construction site). It becomes a shared virtual reality and a consensual hallucination (Gibson, 1984), which is "generating an entirely new dimension to geography" (Batty, 1997: 339).

This *a priori* ontology of cyberspace as simultaneously infinite and fixed is prevalent in much of the popular and academic literatures on the potentials of cyberspace (Graham, M. (2010). *The spatialities of the digital divide*, "Unpublished manuscript"). However, despite widespread adoption, it remains that such conceptions of cyberspace are not particularly useful to our understandings of the ways in which the Internet offers a platform upon which virtual megaengineering projects are constructed.

Instead of thinking of cyberspace as an absolute ontic space that is largely disconnected from the physical world, it is perhaps more appropriate to envision cyberspace as "as a socially constructed discourse that simultaneously reflects and constitutes social reality" (Warf, 2001: 6). It can be thought of as existing in a

symbiotic relationship with physical space in which users exist in between the physical and virtual worlds (Graham, 2008; Kitchin, 1998; Zook & Graham 2007b, 2007a). In other words, cyberspace does not allow most users to fully divorce themselves from material realities.

Why do ontologies of cyberspace matter to the construction of the virtual world? The fact that 1.5 billion people are not actually being brought into a singular virtual space means that despite the global reach of megaprojects like Wikipedia, there remain pronounced geographic biases which are unsurprisingly not dissimilar from the biases in the internet itself (c.f. Castells, 2002; Dodge and Kitchin, 2001; Gorman & Malecki, 2002; Townsend, 2001; Zook, 2000). These biases generally take two forms.

First, just because a non-proximate labor force can hypothetically be brought together from all corners of the globe, does not necessarily mean that it will. It is increasingly clear that a large part of the user-generated content on the internet is created by people in the world's wealthiest countries (EthnicLoft, 2006; Zook & Graham, 2009). Furthermore, not only is there a geographic bias in the creation of content, but it also seems that most contributors are young, highly-educated, and male. A 2008 survey of Wikipedia, for example, found that only 12.8% of contributors were female and the average age was 26.8 years (Wikipedia, 2009). The fact that English is a dominant language on the internet explains some of this bias (Flammia & Saunders, 2007). Social norms, practices, and restrictions also play a significant role. For instance, studies have found that because of the persistence of masculine logics of conflict and honor on the internet, female contributors are often ignored, trivialized, or criticized by their male counterparts (Morahan-Martin, 1998; O'Neil, 2009). Crucially, it also seems likely that it is only those possessing the luxuries of large amounts of disposable time and income that can contemplate donating their labor for free.

Second, and perhaps more importantly, just because online content can be created that references any point in the physical world does not necessarily mean that it will (Graham, 2010). Representations of the physical world in cyberspace are overwhelmingly biased towards cities in North America, Western Europe, and East Asia (Zook & Graham, 2009). Large parts of the world remain terra incognita in cyberspace, while others are characterized by myriad layers of detail (Graham, 2010). The differences between various parts of the Earth in cyberspace are often staggering. For instance, in Google Earth, there is now more user-generated virtual content about the Tokyo metropolitan area than the entire continent of Africa (Zook & Graham, 2009). We are, therefore, seeing a correlation between the locations in which the non-proximate labor force is based and locations about which they are creating content.

5.4 Cloud Collaboration

Capitalism has discovered a way to exploit the labor power of a whole new population. The only thing better, from the capitalist's point of view (especially in terms of low-skilled

work), than a low-paid worker is someone (the consumer) who does the work for no pay at all. In Marxian terms, the worker produces a great deal of surplus value, the consumer who "works" produces nothing but surplus value.

(Ritzer, 2009: 20)

We have seen that labor resources can now be pooled in ways never before imagined. Yet, puzzling questions remain. Why are millions of people contributing their labor for no apparent material rewards? Who is organizing all of this labor? And perhaps most importantly, who is benefitting?

Cloud collaboration, in many ways, appears to represent a step away from the systems of exchange that we are familiar with in contemporary capitalism. The means of production have in many cases become a virtual commons, and private virtual property has become devalued with the emergence of a widespread gift-culture (Barbrook, 1998, 2000; Barbrook and Cameron, 2001).

Millions of people are willing to contribute their labor for free in order to share original and remixed contributions with the world as part of the online tapestries of intertextuality (Diakoupoulos, Luther, Medynskiy, & Essa, 2007). Some people simply enjoy contributing, while others do it for personal gain and recognition (Ritzer, 2009). However, behind most contributions lies a belief in the transformative power of the new projects and spaces that are being created. Cyberspace has often been argued to be a bastion of freedom away from many of the constraints inherent to our physical existences. For instance, John Perry Barlow, the author of the now famous "Declaration of Independence of Cyberspace," stated (to those who seek to control content on the internet) "the global social space we are building to be naturally independent of the tyrannies you seek to impose on us" (Barlow, 1996).

Web 2.0 projects have appeared to be no different, and the organizational structures behind most projects created through cloud collaboration appear to be open, inclusive, transparent, and democratic; thus leading contributors to feel that they are working not for a higher authority with interests divergent from their own, but instead for the good of the virtual communities that they belong to. Many of the projects that rely on cloud collaboration actively recruit their labor force by highlighting ideas of freedom, openness, inclusion, and democracy. The GNU (GNU is a recursive acronym that stands for "GNU's Not Unix") free-operating system project, for example, has created the Uncle GNU poster (Fig. 5.6). The image is a play on the 1914 British "Lord Kitchener Wants You" and the 1917 American "Uncle Sam Wants You" posters, and suggests that contributing to the free-software movement (just like contributing to the war efforts) is some sort of moral duty.

Despite the apparent shift to a freer and more open paradigm of labor, there remain a number of problematic aspects to cloud collaboration. First, it is important to recognize that online projects and communities are not non-hierarchical; there are constraints and controls placed on the enormous amount of work being put forth. These controls can be highly visible and instituted by the corporations or private owners of cyberprojects (Schiller, 1999). Google, for example, often determines what is made visible and invisible on the internet based on human judgments about value (Zook & Graham, 2007a). Controls can also be far less visible (but no less powerful and effective) when they are based on factors like charisma, markets, social

I WANT YOU

NEAREST COMPUTER STATION

Fig. 5.6 Uncle GNU. (Source: Wikipedia.org)

norms, and architecture (code) (Lessig, 1999). Mathieu O'Neil (2009:79) notes that underneath the rules and institutional structures of many online projects there exists an archaic residue: "a zone of rude aggression which is primarily the site of ritualised male proofs of valour and honour." The charisma of certain personalities (for example, the founder of Wikipedia is able regularly overrule collective decisions due to his prestige) and the transfer of forms of domination and hierarchy into the online world from the offline one means that the construction and organization of online projects is governed by more than just codified rules (O'Neil, 2009). Furthermore, because non-codified forms of power are often difficult to see and pin down, the design and meta-construction of most projects created through cloud collaboration remains a black box to most contributors.

Perhaps more worrying are the ways that the financial rewards of cloud collaboration are distributed. O'Neil (2009: 21) argues that "with the mass rise of Web 2.0 and, in particular, of social networking platforms: consumers are now *themselves* expected to provide the content which will then be used to attract advertising revenue." Cloud collaboration is thus simply facilitating the accumulation of profits to

Table 5.2 Ownership of selected cloud-collaboration projects

Social spaces		Content spaces		Cosmographies	
Project	*Owner*	*Project*	*Owner*	*Project*	*Owner*
Facebook	Private company	Flikr	Yahoo!	Bing Maps	Microsoft
Linkedin	Private company	WikiAnswers	Private company (Answers Corporation)	Google Earth	Google
Match.com	Private company (IAC/InterActiveCorp)	Wikichains	Non-profit	OpenStreetMap	Non-profit (OpenStreetMap Foundation)
Second Life	Private company (Linden Lab)	Wikipedia	Non-profit (Wikimedia Foundation)	WikiMapia	Private company
Warcraft	Private company (Activision Blizzard)	YouTube	Google	Wikipedia	Private company (Internet Brands)

Source: author

those in control of the advertising space of each project (see also Fuchs, 2008). In other words, with cloud collaboration, consumers (because they are also producers) end up paying for their own means of production (Ritzer, 2009).

George Ritzer (Ritzer, 2009: 24) argues that this system of labor is inherently a form of control and exploitation. He states that:

> While it may not in the beginning have been capitalistic, prosumption on Web 2.0 is moving seemingly inexorably in that direction. That is, web sites that might have been created with grand intentions are increasingly being bought up by, or attracting the attentions of, major corporations that are seeking to acquire them because they see in them a huge source of income and profit.

Many companies have now recognized that it makes sound economic sense to use the "wisdom of crowds" to make profits (Finkelstein, 2008). Most of the largest cloud collaboration projects are run by for-profit companies (Table 5.2). Only three of the projects listed in Table 5.2 are operated on a not-for-profit basis, and every major social networking website (e.g. Facebook, LinkedIn, Myspace, Orkut, Second Life, Twitter, etc.) is run as a for-profit company despite relying almost entirely on freely submitted content. In addition, some of the largest and most popular (and in many cases the most profitable) websites on the internet owe a large degree of their success to incorporating cloud collaboration into their business model. For instance, Google has developed a system in which people can place tags on any image in order to improve the Google image search results, and a significant amount of the content on the Amazon group of websites now consists of user-submitted reviews and rankings.

It is well known that capitalism is always searching for new, innovative, and more effective forms of exploitation (Ritzer, 2009; Roemer, 1982). However, some such as Tapscott and Williams (2007) now argue that cloud collaboration is simply exploitation that has gone too far. Exploitation is not a simple coercive production practice in the Web 2.0 ecosystem, but is rather something far less obvious. Often repeated claims about shared, open, transparent, and democratic cyberspaces are in many cases failing to match the realities of privately owned and for-profit projects created by an unpaid labor force of millions.

5.5 Conclusions

Cloud collaboration has allowed projects of previously unimaginable scale and scope to be constructed. Social spaces have brought together the work of hundreds of millions of people to construct a detailed database about a significant portion of the world's population. Wiki spaces have provided a forum for millions of people to create and categorize almost all forms of human knowledge; cosmographies similarly have allowed millions to map out countless features of the Earth in centralized databases.

Although the internet and various Web 2.0 frameworks have allowed a pooling of labor power from all over the world, the projects created by cloud collaboration

are not created by a representative sample of the world's population. Rather than bringing everyone into a global village, the internet instead enables hybrid physical/virtual spaces to be created that can never eliminate the global economic inequalities that characterize the physical world. Projects built through cloud collaboration are thus overwhelmingly created by people in cities in North America, Western Europe, and East Asia, and online representations of the physical world are equally biased towards those same places.

Perhaps most troubling is the fact that despite oft repeated claims about cloud computing being a way for humanity to build a shared, open, transparent, and democratic space, new cyberspaces are frequently subject to many of the same forms of control and power relations that characterize the offline-world. It seems particularly problematic that large profits are being made from freely contributed labor. The dream of a digital commons, democratically constructed by people from around the world, may yet be realized. However, until then, it will remain important to ensure that the many new megaengineering projects on the internet represent more than just new forms of exploitation.

Notes

1. The founder of FSF, Richard Stallman, believes that his organization's goal will ultimately "liberate everyone in cyberspace" (Daly, 2009).
2. It should be pointed out that such projects are not limited to the free or open source community. Microsoft Vista took five years and 10,000 workers from around the world to build (Takahashi, 2006).
3. For instance, it is estimated that 60,000 years of work were contributed to the Fedora Linux operating system released in 2008 (Kelley, 2009).
4. While it may initially seem remarkable that embassies are being established in a virtual world, the fact that the population of Second Life is larger than that of a number of countries makes this trend less surprising.
5. The largest languages on Wikipedia are English (2.9 million articles), German (900,000 articles), French (810,000 articles), and Japanese (590,000 articles). The language of Wikipedia content is thus more closely related to indices of wealth and prosperity than the total number of speakers of any given language (e.g. more Wikipedia content has been created in relatively small languages like Dutch or Swedish than in languages like Chinese or Bahasa Indonesian with many more speakers).
6. Some of the cosmographies do not host much of their content themselves, but rather import it from third-party collators of user-generated content. Google Maps and Google Earth, for example, incorporate photographs that people upload to Panoramio.com and comments that people upload to Tripadvisor.com.
7. The Google Earth Community is an online forum focused on producing and organizing placemarks that can be viewed in the Google Earth software.

References

Barbrook, R. (1998). The hi-tech gift economy. *First Monday 3*(12). Retrieved June 1, 2009, from http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1517/1432
Barbrook, R. (2000). Cyber-communism: How the Americans are superseding capitalism in cyberspace. *Science as Culture, 9*(1), 5–40.

Barbrook, R., & Cameron, A. (2001) Californian ideology. In P. Ludlow (Ed.), *Cyrpto Anarchy, Cyberstates, and Pirate Utopias* (pp. 363–387). Cambridge, MA: MIT Press.

Barlow, J. P. (2009). *A declaration of the independence of cyberspace*. 1996. Retrieved May 19, 2009, from http://homes.eff.org/~barlow/Declaration-Final.html

Batty, M. (1997). Virtual geography. *Futures, 29*(4/5), 337–352.

Bauwens, M. (2005). The political economy of peer production. Ctheory td026.

Beer, D. (2008). Making friends with Jarvis Cocker: Music culture in the context of Web 2.0. *Cultural Sociology, 2*(2), 222–241.

Boellstorff, T. (2008). *Coming of age in second life*. Princeton: Princeton University Press.

Breen, M., & Forde, M. (2004). The music industry, technology and utopia – an exchange between Marcus Breen and Eamonn Forde. *Popular Music, 23*(1), 79–89.

Butler, D. (2006). Virtual globes: The web-wide world. *Nature, 439*, 776–778.

Castells, M. (2002). *The galaxy*. Oxford: Oxford University Press.

Ciffolilli, A. (2003). Phantom authority, self–selective recruitment and retention of members in virtual communities: The case of Wikipedia First Monday 8(12).

Daly, S. (2009). *Interview with Richard Stallman*. Groklaw 2006. Retrieved April 27, 2009, from http://www.groklaw.net/article.php?story=20060625001523547

Diakoupoulos, N., Luther, K., Medynskiy, Y., & Essa, I. (2007). The evolution of authorship in a remix society. Paper read at HT'07, September 10–12, at Manchester.

Dodge, M., & Kitchin, R. (2001). *Atlas of cyberspace*. London: Addison-Wesley.

Dodson, S. (2005). Worldwide Wikimania Guardian Unlimited, October 3.

Edwards, I. E. S. (1985). *The pyramids of Egypt*. London: Penguin Books.

EthnicLoft. (2009). *Preserving ethnic languages: Swahili on Wikipedia*. Newsvine.com 2006. Retrieved April 25, 2009, from http://ethnicloft.newsvine.com/_news/2006/09/06/353434-preserving-ethnic-languages-swahili-on-wikipedia

Finkelstein, S. (2008). When you have a Wikipedia, everything looks like an edit. Guardian, 8 May.

Flammia, M., & Sanders, C. (2007). Language as power on the internet. *Journal of the American Society for Information Science and Technology, 58*(12), 1899–1903.

Fuchs, C. (2008). *Internet and society: Social theory in the information age*. London: Routledge.

Gibson, W. (1984). *Neuromancer*. London: Harper Collins.

Goodchild, M. F. (2007). Citizens as sensors: The world of volunteered geography. *GeoJournal, 69*(4), 211–221.

Gorman, S. P., & Malecki, E. J. (2002). Fixed and fluid: Stability and change in the geography of the internet. *Telecommunications Review, 26*(7–8), 389–413.

Graham, M. (2008). Warped geographies of development: The internet and theories of economic development. *Geography Compass, 2*(3), 771–789.

Graham, M. (2010). Neogeography and the palimpsests of place: Web 2.0 and the construction of a virtual earth. *Tijdschrift voor Economische en Sociale Geografie, 101*(4), 422–436.

Graham, M. (2011). *Time machines and virtual portals: The spatialities of the digital divide*. Progress in Development Studies (in press).

Grossman, L. (2006). Time's Person of the Year: You. Time.

Hall, M. (2007). On the mark: Will democracy vote the experts off the GIS island? Computerworld News. Retrieved June 1, 2009, from http://www.computerworld.com/action/article.do?command=viewArticleBasic&articleId=299936

Kelley, K. (2005). We are the Web. *Wired 13*(8). Retrieved June 1, 2009, from http://www.wired.com/wired/archive/13.08/tech.html

Kelley, K. (2009). The new socialism: Global collectivist society is coming online. *Wired 17*(6). Retrieved June 1, 2009, from http://www.wired.com/culture/culturereviews/magazine/17-06/nep_newsocialism

Kitchin, R. (1998). Towards geographies of cyberspace. *Progress in Human Geography, 22*(3), 385–406.

Lessig, L. (1999). *Code and other laws of cyberspace*. New York: Basic Books.

McCullough, D. (1977). *The path between the seas: The creation of the Panama Canal, 1870–1914*. New York: Simon and Schuster.

McLuhan, M. (1962). *The Gutenberg galaxy: The making of typographic Man*. Toronto: University of Toronto Press.

Morahan-Martin, J. (1998). The gender gap in Internet use: Why men use the Internet more than women—A literature review. *CyberPsychology and Behavior, 1*(1), 3–10.

O'Neil, M. (2009). *Cyber chiefs: Autonomy and authority in online tribes*. London: Pluto Press.

Obama, B. (2009). Obama's remarks on cyber-security. *New York Times 2009*. Retrieved May 30, 2009, from http://www.nytimes.com/2009/05/29/us/politics/29obama.text.html

Raymond, E. S. (1999). *The cathedral and the bazaar*. Sebastapol, CA: O'Reilly.

Ritzer, G. (2009). Production, Consumption . . . Prosumption? *Georgeritzer.com Work in Progress*. Retrieved June 1, 2009, from http://www.georgeritzer.com/work.html

Scanlon, J. H., & Wieners, B. (2009). The cloud. *The Industry Standard 1999*. Retrieved April 26, 2009, from http://www.thestandard.com/article/0,1902,5466,00.html

Roemer, J. (1982). *A general theory of exploitation and class*. Cambridge, MA: Harvard University Press.

Scanlon, J. H., & Wieners, B. (2009). The cloud. *The Industry Standard 1999*. Retrieved April 26, 2009, from http://www.thestandard.com/article/0,1902,5466,00.html

Schiller, D. (1999). *Digital capitalism: Networking the global market system*. Cambridge, MA: MIT Press.

Scott, L. (2009). Personal correspondence with Laura Scott: Communications and Public Affairs Officer at Google, June 1.

Takahashi, D. (2006). Why Vista might be the last of its kind. The Seattle Times, Dec 4.

Tapscott, D., & Williams, A. SD. (2007). *Wikinomics: How mass collaboration changes everything*. New York: Penguin.

Townsend, A. M. (2001). Network cities and the global structure of the internet. *American Behavioral Scientist, 44*(10), 1697–1716.

Verner, M. (2001). *The pyramids*. New York: Grove Press.

Warf, B. (2001). Segueways into cyberspace: Multiple geographies of the digital divide. *Environment and Planning B: Planning and Design, 28*, 3–19.

Wikipedia: The Free Encyclopedia. (2009). Wikipedia: About. *Wikimedia Foundation 2009*. Retrieved April 14, 2009, from http://en.wikipedia.org/wiki/Wikipedia:About

YouTube. (2009). Zoinks! 20 hours of video uploaded every minute! *YouTube 2009*. Retrieved June 5, 2009, from http://www.youtube.com/blog?entry=on4EmafA5MA

Zook, M. (2000). The economic geography of commercial content production in the United States. *Environment and Planning A, 32*, 411–426.

Zook, M., & Graham, M. (2007a). The creative reconstruction of the internet: Google and the privatization of cyberspace and digiPlace. *Geoforum, 38*, 1322–1343.

Zook, M., & Graham, M. (2007b). Mapping digiPlace: Geocoded data and the representation of place. *Environment and Planning B: Planning and Design, 34*(3), 466–482.

Zook, M., & Graham, M. (2009). Mapping the GeoWeb: The spatial contours of Web 2.0 cyberspace. In *Association of American Geographers Annual Meeting*. Las Vegas, NV.