Research Article

Transparency and Development: Ethical Consumption Through Web 2.0 and the Internet of Things

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Abstract

Commentators are now pointing to the potential for a globalization of knowledge and transparency that will harness the power of the Internet to allow consumers to learn more about the commodities they buy. This article discusses the potential for emergent Web 2.0 technologies to transcend barriers of time and space, both to facilitate flows of information about the chains of commodities, and to open up potential politics of consumer activism, particularly to influence the way goods that originate in the Global South are produced. We argue that these prospects are ultimately tempered by a number of persistent barriers to the creation and transmission of information about commodities (infrastructure and access, actors' capacities, the continued role of infomediaries, and intelligent capture and use by consumers).

1. Introduction

A central challenge in contemporary processes of economic globalization is that information about commodities has not been globalized at the same rate as the commodities themselves. Contemporary capitalism conceals the histories and geographies of most commodities from consumers. These consumers rarely have opportunities to gaze backward through the chains of production to gain knowledge about the sites of production, transformation, and distribution of products. The complexity of commodity chains leaves us with highly opaque production processes. Transnational companies often strive to maintain this opacity through a separation between the "airbrushed world" communicated through advertising (Jhally, 2003) and the actual world of production.

Increasingly complex structures of production are driven by transnational corporations (TNCs) in their quest for efficiency, new markets, and new competitive advantages (Dunning, 1993). TNCs generally break production processes into networks and chains that are constituted by complex sets of geographically separated nodes (see Gereffi, 2005). The lack of association between commodities and information about commodity production has led to an increase in demands from consumers in the Global North for greater transparency in production processes. Many of these demands can be seen in the context of "anti-globalization" criticism against transnational corporate practices, and as a battle of information over what goes on in the factories and *maquiladoras* of the Global South. Campaigns around fair trade and corporate social responsibility have convinced large numbers of consumers that their purchasing practices do

have global repercussions. In turn, some TNCs have responded by constructing detailed narratives of product histories to assure consumers of their ethical production practices.

Nongovernmental organizations (NGOs) and social movements have made use of the Internet to spread information about campaigns aimed at the social and environmental effects of corporate practices. Langman (2005) suggests that the Internet provides an infrastructure for "internetworked social movements" and an alternative public sphere through which information about corporate practices can be exchanged and used for strategy. Yet for the most part, information being transmitted through producers and branders means that narratives constructed about upstream nodes in commodity chains can be difficult to challenge. It has been virtually impossible for actors in the Global South, particularly those subject to oppressive labor practices or destructive environmental practices, to challenge these narratives and communicate counternarratives. At the same time, a number of commentators are now pointing to the potential for a different type of globalization—this one characterized by knowledge and transparency and able to harness the power of the Internet to allow consumers to learn more about the commodities that they buy. This globalization is based on emergent Web 2.0 frameworks and technologies that are characterized by user-generated information, user-centered design, sharing of information, and collaborative development of knowledge.

This article discusses whether increased access to commodity chain information can foster progressive social and environmental change by enabling more ethical consumption. More specifically, we discuss the potential for emergent Web 2.0 frameworks to transcend barriers of time and space to facilitate flows of information about the chains of commodities, thereby encouraging consumers to make informed economic decisions by being more aware of the social, political, and environmental impacts of available products. It has already been suggested that information and communication technologies (ICTs) can aid development through access to information, reduced transaction and transportation costs, and new business opportunities (Heeks, 2008;

Overå, 2006; Thompson, 2007). Our perspective on Web 2.0 and commodity chain transparency adds another element to this debate by outlining potential ways for marginalized communities to share information about labor and environmental conditions of production. User-generated content and what has been dubbed the "Internet of Things" have opened up new possibilities for both mapping commodity chains on the Internet and integrating "guerrilla cartography" with the politics of production and consumption. This globalization of knowledge and transparency therefore offers the potential to alter the politics of consumption and practices of production, as well as to empower marginal individuals and communities. However, these hopes are ultimately tempered by a number of persistent barriers to the creation and transmission of information about commodities (infrastructure and access, actors' capacities, the continued role of infomediaries, and intelligent capture and use by consumers). Unleashing the potential of these technologies therefore ultimately depends on technological change being embedded in broader processes of local capacitation, democratization, and social change.

2. Economic Globalization and Mediated Flows of Information

Transparency and flows of information in commodity chains have a long-standing link to distance and proximity. Geographers and other social scientists have argued that these relationships are centrally important to understanding the distribution and transmission of knowledge (Eldridge & Jones, 1991; Feldman, 1994; Jafe, Trajtenberg, & Henderson, 1993), and that transmission costs and boundaries impede the flow of information (Audretsch & Feldman, 1996; Krugman, 1991). Traditionally, consumers have possessed more knowledge about nodes on commodity chains that are close to them in absolute distance than nodes that are farther away.[1] For instance, in the commodity chains of bread sold in Manchester, England in the 18th century, most consumers would have been more likely to have had knowledge (related to characteristics such as production practices, ownership, or labor

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1. This is not to imply that there is any necessary correlation between physical proximity to nodes on a commodity chain and topological proximity to positions of nodes on commodity chains.
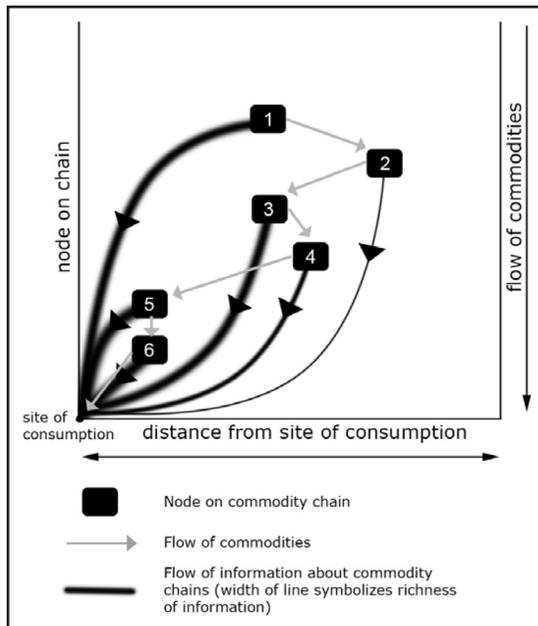
Figure 1. Simplified Representation of Flows of Information About Nodes on a Commodity Chain.[2] Source: Authors.

issues) about bakeries in their neighborhood than about wheat farms in Southern England, Sweden, or Poland (Hopkins & Wallerstein, 1994). The transmission of information is thus highly constrained by distance (see Figure 1).

Early waves of globalization brought new types of goods to consumers in the North through increasing trade and by organizing colonies to supply the raw materials for industrialization. By the 1930s, the contours of a consumer economy were emerging with the development of Fordist mass production, the first multinational companies, and an international financial sector. All of this was aided by new systems of communication, including radio and film (Shaw, 2001). Advertising and films can be considered the trusted infomediaries of the era, communicating what today would be considered gendered and racialized stereotypes without much concern for the production conditions in the colonies or in the domestic factories. Industrialization also went hand in hand with labor organization,

and unions systematically used newspapers and pamphlets to communicate and agitate around working conditions (Mason, 2007). Ethical consumption campaigns grew out of the emergence of NGOs from the 1970s on, and after the advent of the Internet, NGOs have been apt to use it as a tool to network and communicate. Mediators of information about products have therefore changed over time, and new infomediaries have been able to alter the basic relationships between proximity and transparency.

Today, a variety of organizations have developed reputations as trusted infomediaries for their critical analysis of the commodity chains of products. Consumer watchdog magazines such as *Which?* (UK), *Consumer Reports* (United States), and *Stiftung Warentest* (Germany) are targeted primarily at consumers in wealthy countries and reveal information that producers typically seek to conceal. Myriad public interest groups also make it their mission to distribute information about the hidden practices of many TNCs. Reports on Shell's environmental record in the Niger Delta, Mattel's use of child laborers in Sumatra, and Nike's sweatshops in Vietnam are just a few of many examples of this sort of investigative interest in the origins of goods and commodities (Klein, 2002).

Consumer knowledge about distant nodes can have powerful effects on both the consumers and producers of commodities. Without any information transfer about the sites of production, knowledge about products remains highly localized. For example, bananas grown on St. Lucian plantations, shoes made in Vietnamese factories, and most other items we find in our supermarkets are certainly globalized products, but consumers in distant locations lack information about their production. With media intervention, information about fair trade practices on banana plantations or child labor in shoe factories can become as globalized as the bananas or shoes themselves, potentially reshaping how those commodities are consumed and ultimately produced.

Yet, mediated information about nodes on commodity chains is necessarily incomplete and can give rise to the transmission of information about nodes

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2. In this article, we take a commodity to mean any good that results from a production process, meets perceived or actual needs, and has an exchange value (Clarke, 2003). Although the chains of different types of commodities react differently to transparency and consumer politics, it is beyond the scope of this article to discuss this in detail here.
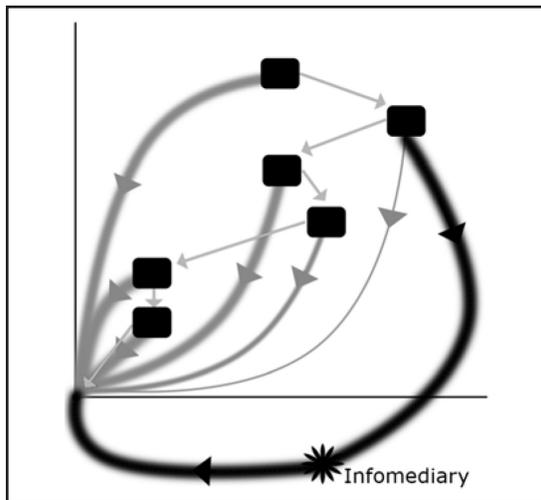
Figure 2. Altered Flows of Information Due to Media Interventions. Source: Authors.

on chains in ways that contradict distance decay models, such as that of Figure 1. For instance, through documentary reporting and feature stories of coffee growers in Kenya, many consumers in London have a detailed understanding of exploitative production practices on some farms in Central Kenya, but they continue to have little or no knowledge about how coffee is roasted in Europe.

Therefore, with the ever-increasing importance of infomediaries and their uses of communication technologies, the relationships between distance (either absolute or topological) and the flows of information become less clear (see Figure 2). In particular, the Internet is frequently thought to alter the link between proximity and transparency in several ways. First, the Internet strengthens what has been called the "spotlight effect" (Letnes, 2002), whereby NGOs, activists, and journalists publicize information about unsavory corporate practices. Such stories are occasionally rebroadcast by mainstream media and can have costly and harmful effects on corporate reputations. Second, the Internet can assist with the spreading of campaigns that target general production practices, advocate legal changes, or protest trade agreements. The Internet facilitates both coordination among activists within a network and the outreach of these networks to potential supporters (Illia, 2003; Kavada, 2005; Keck & Sikkink, 1998). Finally, the Internet can function as an alternative public sphere where norms and strategies are communicated and debated.

The adoption of the Internet to globalize information has inspired a multitude of projects dedicated to mapping, visualizing, and communicating conditions at production sites in the Global South to activists and consumers in the Global North. Welford (2002), for instance, sees the emergence of a "new wave of globalization" where increased transparency aids the struggle for human rights. Similarly, it is frequently argued that communication technologies such as the Internet have unique capacities to create democratic and participatory spaces for information exchange and debates (Langman, 2005).

Participatory spaces are not solely emerging in the Global North. Overå (2006), for example, illustrates this by a study of how "telecommunication pioneers" in informal trading in Ghana have changed their mode of operation to reduce both transportation and transaction costs. Heeks (2008) argues that ICT implementation in the Global South is moving from a first generation, in which designs were imposed and the poor were expected to adapt to them, to a second generation that is increasingly designed around the specific resources, capacities, and demands of the poor. Wikis can be used to keep politicians accountable to the public through projects, such as mzalendo.com in Kenya (subtitled "Eye on Kenyan Parliament"), that allow users to communicate information about the political process (Thompson, 2007). Another example is *Ushahidi,* an open source tool that allows users to share information on disasters and crises using SMS, e-mail, and the Web, so that spatially distributed data can be gathered and visualized in timelines or maps. This tool has been utilized in relation to natural disasters, pandemics, and violence outbreaks in the Democratic Republic of the Congo, Haiti, Gaza, India, and elsewhere (Zook, Graham, Shelton, & Gorman, 2010). Internet-based social media have played an increasingly important role in U.S. politics, both through the Obama campaign and through the organizing around the so-called Tea Party. A combination of cell phone technology and Internet-based social media also gave the world insight into the repression of the Iranian Green Revolution, which likely restrained the regime's response.

Earlier similar developments lead Weber and Bussell (2005) to see the contours of a "global shared infrastructure" that is sufficiently disruptive to call into question assumptions about the "natural state" of many economic processes and organizational principles. The most optimistic commentators

tend to see the Internet as a new and alternative (or a subcultural) public sphere that subverts the mainstream public sphere controlled by corporate conglomerates (Kahn & Kellner, 2004; Kellner, 1999; Lipschutz, 2005; Olesen, 2005). As an extension of Fraser's (1990) work on "subaltern counterpublics," the Internet is seen as a parallel discursive arena where members of various social groups invent and circulate counter discourses against power. While conceding that there is a danger that computerization of society might increase inequalities, Kellner (1999) argues that a "democratized and computerized public sphere" is necessary to revitalize capitalist democracies, and that it would provide opportunities to overcome structures of inequality.

The Internet and the public sphere it represents are seen as the backbone of a global civil society or a global social movement that has emerged in opposition to neoliberal globalization. The Internet has enabled new kinds of communities to share common grievances and develop strategies to mobilize in accordance with them. The political activist networks that Langman (2005) terms "internet-worked social movements" use electronic communication for recruitment, coordination, leadership, and mobilization. These movements have produced a universalizing dynamic that is taking it beyond a mere series of isolated "militant particularist" struggles (Ashman, 2004). Therefore, social scientists have been interested in movements that attempt to bridge sociospatial differences and thereby alter the scalar dynamics of opposition to globalization (Castree, Featherstone, & Herod, 2008; Haarstad, 2007; Harvey, 2000). While transnational solidarities are obviously not new, present alliances are distinct with regard to the means, speed, and intensity of communication among the various groups involved (Routledge, 2000). As these writings make clear, Internet-aided political movements are changing spatial-political practices and the ways in which we conceptualize them.

Transnational advocacy networks composed of NGOs have perhaps become the most effective infomediary in the politics of consumption by collecting information, bringing it to consumers, and pressuring governments and public agencies (Keck & Sikkink, 1998). Within the activist-based "alter-globalization movement," Kavada (2006) has found that the use of the Internet is an integral part of an organizational model that is open, flexible, and decentralized. This organizational model has been

seen as a new form of collective organization, and it has been argued that these practices should be seen as "convergence spaces," rather than as formal networks or organizational structures (Kahn & Kellner, 2004; Routledge, 2003). These "convergence spaces" represent what is new about Internet-enabled politics—a decentralized and nonhierarchical structure, immediate solidarity, communication and alliance-building across space, and a diffuse networked force that challenges neoliberal globalization. Or as Illia (2003) writes of political campaigns on the Internet, the pressure on companies "is no longer the result of a long aggregation into association, but of an immediate and spontaneous network of relationships."

Yet, it remains that infomediaries only collect or transfer information about a small proportion of the many long-distance commodity chains that traverse the globe. In cases like the Iranian Green Revolution, transparency is increased by the emergence of a temporary international media event. This creates an outpouring of international sympathy for the duration of the media event, which tends to be quickly forgotten as attention moves on to the next crisis. This is the case for commodity chains as well; infomediaries create temporary media events that work through "naming and shaming" of prominent companies, rather than through any approach of systematic data collection. Even though much critical research has tracked the chains of coffee, chocolate, sports shoes, and myriad other high-profile objects, spotlight effects rarely touch the mundane objects that surround our everyday existences. Chains of cabbage, carburetors, and cat food thus remain largely invisible.

Most importantly, by definition, infomediaries mediate information, adding a dense layer of social, economic, political, and technological arbitration between nodes and information access points. Therefore, while networked practices and communication technologies have selectively increased transparency in a range of social areas, there remain significant constraints on the transformative potentials of projects designed by infomediaries for commodity chain transparency.

However, an emerging shift in both virtual production practices and the availability of networked information has led a number of commentators to point to an emerging third model of the relationships between information flows and distance—a model of information flow that has not only sparked

a new way of imagining the links between place and information, but has also been integral to the implementation of a host of projects that aim to fundamentally transform the politics of consumption.

3. The "Internet of Things"

What we're contemplating here is the extension of information-sensing, -processing, and -networking capabilities to entire classes of things we've never before thought of as "technology." (Greenfield, 2006, p.19)

The distinction between "real" and "virtual" is becoming as quaint as the 19th century distinction between "mind" and "body." We want to bring about a connectivity between the physical world, its objects and spaces, and the virtual world of Web sites and environments. (Usman Haque, Pachube.com) (Fong, 2008)

The "Internet of Things" refers to the coding and networking of everyday objects and things to render them individually machine-readable and traceable on the Internet (see Biddlecombe, 2005; Butler, 2006; Dodson, 2008; Gershenfeld, Krikorian, & Cohen, 2004; Lombreglia, 2005; Reinhardt, 2004). Much existing content in the Internet of Things has been created through coded RFID tags and IP addresses[3] linked into an electronic product code (EPC) network.

Imagining the Internet of Things being used to track objects like a can of cola or a box of cereal from sites of production to sites of consumption is perhaps not too difficult to imagine. However, there is a movement under way to add almost every imaginable physical object into the Internet of Things. In New Zealand, for example, all cows will have IP addresses embedded in RFID chips implanted into their hides by 2011 (Wasserman, 2009). This will then allow producers to track each animal through the entire production and distribution process. Furthermore, objects are increasingly able to not just be characterized by a unique identifier, but also to transmit location and context-sensitive data.

The development of the Internet of Things has been primarily driven by the needs of large corporations that stand to benefit greatly from the foresight and predictability afforded by the ability to follow all objects through the commodity chains in which they are embedded (Lianos & Douglas, 2000). The ability to code and track objects has allowed companies to become more efficient, speed up processes, reduce error, prevent theft, and incorporate complex and flexible organizational systems (Dodge & Kitchin, 2005; Ferguson, 2002). Analysts predict that, with the new Internet of Things, "users of the Internet will be counted in billions and . . . humans may become the minority as generators and receivers of traffic" (International Telecommunication Union, 2005). Greenfield (2006) perhaps best captures the move toward the Internet of Things by arguing that:

[E]ver more pervasive, ever harder to perceive, computing has leapt off the desktop and insinuated itself into everyday life. Such ubiquitous information technology "everyware"—will appear in many different contexts and take a wide variety of forms, but it will affect every one of us, whether we're aware of it or not. (p. 19)

In fact, there are so many objects that have already been assigned IP addresses that analysts predict that all 4.3 billion addresses will run out by 2011 (Dodson, 2008). The solution to this problem is the new IP system of addressing, under which there will be 2^{128} potential addresses, or the equivalent of 39,614,081,257,132,168,796,771,975,168 addresses for every living person. The sheer immensity of potential addresses reflects the many powerful voices within the organizations that oversee the architecture of the Internet, such as the Internet Engineering Task Force, and that foresee an Internet of Things in which most of the objects that are made and sold can be addressed and linked to databases of information.

Blending the physical and the virtual by tagging actual products with networked information produces new spaces for consumption politics. It has also led some commentators to wonder whether objects are becoming sentient (Thrift & French, 2002; Tuters & Varnelis, 2006; Want, Fishkin, Gujar, & Harrison, 1999), and to argue that we are approaching a future filled with "rhizomic assemblages of power/knowledge" (Dodson, 2004), where codes become part of the "technological unconscious" (Thrift, 2004). Dodge and Kitchin (2005) argue that this growing pervasiveness of

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3. An IP address is a label assigned to any object that uses the Internet Protocol for communication.

identification codes and informational systems to monitor and regulate population works to create a universal panopticon that will enable its users to "know simultaneously and in real time the what, when, and where of people and things."

In order for the Internet of Things to incorporate the billions of objects that are made, moved, and consumed, it could be assumed that every one of those objects would require a unique identifier (through a combination of cheap RFID and IP addresses). However, a number of commentators are now arguing that it may not be necessary to physically tag and code every single physical thing to bring the Internet of Things into being. Such arguments are based on the transfiguration that has occurred in the ways that information is created and made available on the Internet. Even without barcodes, RFID tags, and IP addresses on every physical object, user-generated content has brought together a critical mass of data about many aspects of the physical world.

4. The Second and Third Generations of the Internet

The undeclared logic of the machine-readable world is "all data, all the time, on all people, at all places." (Dodge & Kitchin, 2005, p. 870)

This metamorphosis in the production and accessibility of digital information has, until recently, been most often described as Web 2.0, or the second wave of the Internet. Web 2.0 is generally characterized by user-generated information, user-centered design, sharing of information, and the collaborative development of knowledge (Graham, 2010). In principle, anybody, anywhere on the planet, with the requisite hardware and software and an Internet connection, can now contribute to Web 2.0 projects like Wikipedia, YouTube, or Flikr, thus implying that 2 billion people (the current number of Internet users) can potentially create, upload, and share information about any aspect of the world (Beer, 2008; Breen & Forde, 2004; Goodchild, 2007; Graham & Zook, in press; Kelley, 2005; Richtel, 2009).

More recently, there has been talk about a move toward another paradigm shift in how people use the Web, and it has been designated as *Web Squared.* Tim O'Reilly (the inventor of the term *Web 2.0*) and John Battelle use the Web Squared moniker to refer to the Internet becoming more intelli-

gent as an exponentially increasing amount of content is being created and uploaded. The innovation of Web Squared is that a sufficient body of data exists to allow the Web to "learn" inferentially, absorbing more knowledge than that which is purposely entered into it. O'Reilly and Battelle view the Internet as:

> . . . no longer a collection of static pages of HTML that describe something in the world. Increasingly, the Web is the world—everything and everyone in the world casts an "information shadow," an aura of data which, when captured and processed intelligently, offers extraordinary opportunity and mind bending implications. Web Squared is our way of exploring this phenomenon and giving it a name. (O'Reilly & Battelle, 2009, p. 2)

A variety of authors see *cloud collaboration* (decentralized and often uncoordinated work or information gathering through the Internet) and Web Squared as the basis of an informational revolution, predicting that it will fundamentally change the ways in which decentralized collective intelligence about objects moves through the world (Graham, in press[b]; Jennings, 2008; O'Reilly, 2005; Vogelstein, 2007; Whitlock & Micek, 2008). Information about commodities and things is constantly being collected and uploaded (often in real time), and as a result, O'Reilly and Battelle (2009) argue the following:

> [W]e'll get to the "Internet of Things" via a hodgepodge of sensor data contributing, bottom-up, to machine-learning applications that gradually make more and more sense of the data that is handed to them. A bottle of wine on your supermarket shelf (or any other object) needn't have an RFID tag to join the "Internet of Things," it simply needs you to take a picture of its label. Your mobile phone, image recognition, search, and the sentient web will do the rest. We don't have to wait until each item in the supermarket has a unique machine-readable ID. Instead, we can make do with bar codes, tags on photos, and other "hacks" that are simply ways of brute-forcing identity out of reality. (O'Reilly & Battelle, 2009, p. 8)

In other words, Web Squared brings about possibilities to tag information directly onto previously nonnetworked objects. It relies on people to act as networked sensors to fill in gaps not covered by RFID tags, IP addresses, and other forms of tracking
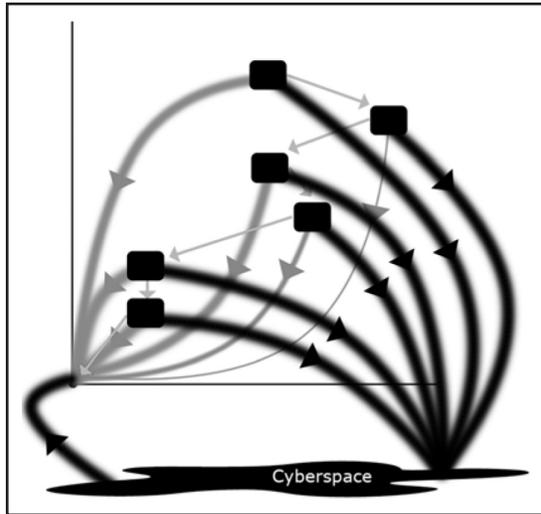
Figure 3. "Web Squared" and Ubiquitous Information. Source: Authors.

and information storage (see also Goodchild, 2007) by uploading imagery, video, motion, proximity, and location data. It thus follows that, ultimately, few objects will be able to exist "outside" the network.[4]

For the transparency of commodity chains, these developments can significantly decenter the role of infomediaries in the collection and transmission of information about the sites of production. The technologies theoretically enable the bypassing of layers of arbitration to provide an immediate online mapping of information on commodity chains, either at the hands of end users, or as a result of direct Internet absorption of information. This technological infrastructure can therefore become interlinked with an empowering consumer activist politics that tags commodity chain information onto products in new ways, articulating new relationships between proximity and transparency. Web Squared and the Internet of Things thus potentially provide a model for the future that is similar to the one presented in Figure 3. In that new model, a critical mass of data, ubiquitous computing, and intelligent systems allow

frictions of distance to be effectively negated, and the massive amounts of available data to be categorized and channelled. In other words, the Internet of Things and Web Squared can be used to create a new layer of information that lets consumers see the histories and geographies of any commodity, to see its existence beyond the here and now.

References to ubiquitous information abound within the myriad projects attempting to use the informational model presented in Figure 3 to inspire a new politics of consumption.[5] It is not just that communication technologies can transport consumer information instantly across space (something that has been possible ever since the invention of the telegraph). Rather, these new technologies provide a potentially widely accessible infrastructure for virtual mapping of product information, and they make that mapping available in everyday life. For instance, they can integrate consumption practices with on-the-spot product information accessible through mobile phones. Consumer activism then can become focused on the use of frameworks that allow both the submission of user-generated content and the use of content produced and sorted by other users. This would, for example, allow a consumer to pick up a box of tissues at the supermarket, scan it with a cell phone, and get access to user-generated information about the environmental impacts of the production process, as well as the ways in which those impacts compare to the competing products. For food products, customers could, through mobile devices, similarly access information on nutrition values, gene modification, transportation distance, labor conditions, and a range of other factors that would allow them to adjust their economic decisions accordingly.

The leader of one such project, designed at the 2007 London Social Innovation Camp,[6] described his technology by noting, "We set out to try and make something that links products in the real world to information on the Internet using barcodes. So, making any product, anywhere, addressable on the

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4. Furthermore, it is increasingly likely that WebCrawlers will be able to harvest enough information from the Internet to automate evaluation and comparison of products, based on their environmental impact, and then link this evaluation to certification standards (Foster, n.d.).

5. Examples include alonovo.com, barcodepedia.com, buyitlikeyoumeanit.org, consumergadget.net, en.consumeria .info, en.semapedia.org, ethicalconsumer.org, ethiscore.org, Fair Tracing Project, gooshing.co.uk, howstuffismade.org, makeitfair.org, seewhatyouarebuyinginto.com, and wikichains.com

6. http://jonathanmelhuish.com/2009/02/barcode-wikipedia

Internet and in real-life." The founder of another project similarly claims that:

> We are still living in a world where information is trapped in a few of our objects. We stare into our screens, which are like goldfish bowls full of information swimming around, but unable to escape . . . we dream of a world where information would be a butterfly, flitting freely all over the place, and occasionally landing on any of the objects we touch to give them life and enrich them. (Rafi Haladjian, Violet.net)

These types of visions seem, in many ways, to come dangerously close to technological determinism. Since Marshall McLuhan introduced the notion of the "global village," or the idea that ICTs can bring all of humanity into a shared virtual cyberspace (McLuhan, 1962), commentators have speculated that the Internet would be able to eliminate relative distance. Gillespie and Williams (1988), for example, have argued that the convergence of time and space brought about by ICTs would eliminate the geographic frictions that help to shape spatial differences (see also Cairncross, 1997; Couclelis, 1996; Pascal, 1987). The idea that the Internet could either render geography meaningless or create a global village accessible from all reaches of the planet is grounded in the notion that the Net allows an almost instantaneous transfer of information to any connected device, becoming both an ethereal alternate dimension—simultaneously infinite and everywhere—and fixed in a distinct (albeit nonphysical) location where all participants "arrive" (Graham, in press[a]).

However, geographers have constantly reminded technological determinists that the Internet is grounded by supporting infrastructures with distinct geographical biases (Dodge & Kitchin, 2001a; Hayes, 1997; Moss & Townsend, 2000; Townsend, 2001; Zook, Dodge, Aoyama, & Townsend, 2004). The global village (or cyberspace) can therefore only come into being in specific geographic spaces. Furthermore, it has also been shown that interactions and content on the Internet continue to be both socially produced and shaped by geography (Adams & Ghose, 2003; Dodge & Kitchin, 2001b; Zook, 2003).

Despite these repeated claims that "geography still matters," even a cursory look at most of the projects employing Web Squared and the Internet of

Things to alter consumption politics reveals a renewed attachment to the idea that technology can be used to fundamentally transcend the barriers of distance. However, given the seemingly unique nature (and powerful combination) of Web Squared and the Internet of Things, it is critical to consider more carefully both the potential for and constraints on transcending the barriers to flows of information on commodity chains. If Web Squared and the Internet of Things were to allow ubiquitous access to information about nodes on global commodity chains, the mass of data about all of those nodes would still need to be organized. The following section therefore briefly focuses on the two most widely used methods to index and organize large amounts of data: the wiki model and the search engine model.

5. Barriers to the Ubiquity of Information

Wikis allow Web sites to become containers of user-generated information and knowledge established through consensus. Wikipedia is the prime example of a wiki model, with a stated mission of hosting "the sum of all human knowledge" in every human language (Dodson, 2005). The encyclopedia currently contains 12 million articles in 262 languages. However, other wikis also contain enormous amounts of information created through cloud collaboration (e.g., 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). In principle, wikis have the potential to globalize information and make it freely available, because, generally, they not only allow free access, but also allow anyone to contribute from anywhere—an exercise in both anarchy and democracy that radically opens up the knowledge-creation process (Ciffolilli, 2003). They generally allow anonymous contributions, and so, in theory, do not discriminate based on professional credentials, race, sex, or any other personal characteristics (Graham, in press[b]).

Wikis allow the indexing of structured and codified information (e.g., product codes and ISO numbers), as well as more qualitative, unstructured information (e.g., photographs of factories, videos of production sites, etc.). The relative lack of hierar-
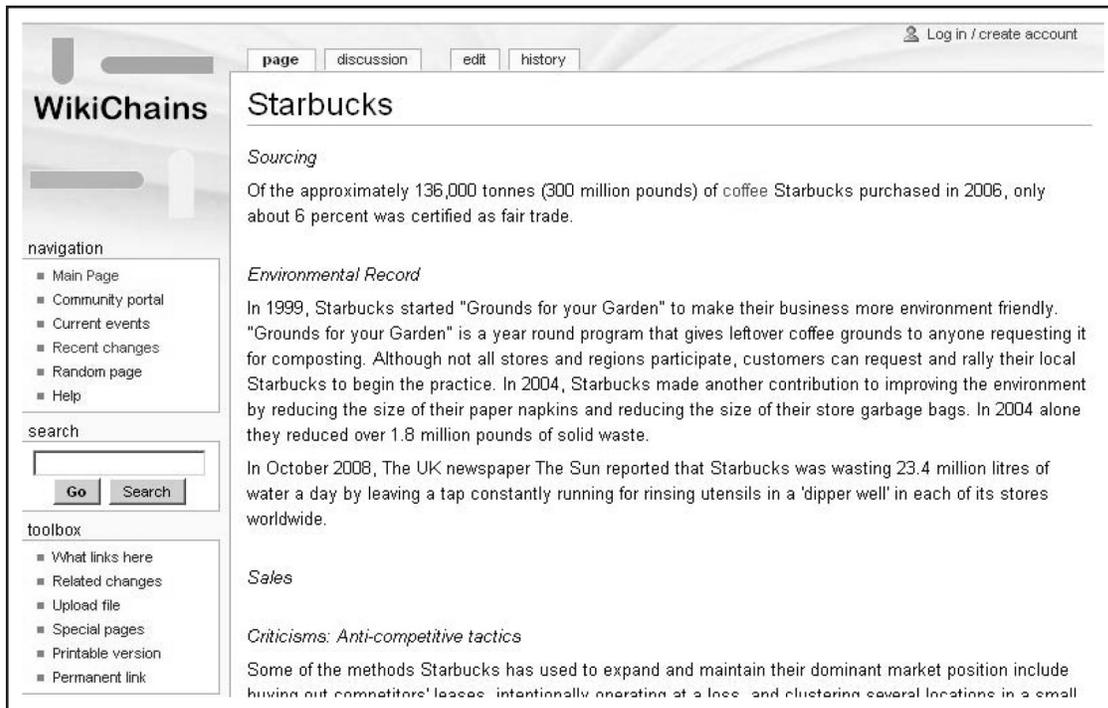
Figure 4. An Example of a Wiki Page. Source: http://wikichains.com/en.wiki/index.php/Starbucks

chy in the editing process means that content can also, in principle, be moved, changed, and deleted instantly, corresponding to the rapidly changing composition of commodity chains. This allows for a cloud-collaborative development of knowledge about commodity chains without the need for, or interference of, formal infomediaries. Realistically, infomediaries can be expected to continue to play a significant role in mobilizing data gathering and consumer campaigns, which, in turn, will be conditioned by current structures of commercial media control. But their role is likely to shift away from being central in the actual production of information to being facilitators of information usage.

Thompson (2007) argues that wiki technologies enable an "architecture of participation" that poses a challenge for much of the way in which "development" has been conceptualized, with its focus on "delivery" of services to the poor. Instead, the focus should be on a "co-creation" in which users can provide input into the content of development projects and policy. While meaningful participation through wikis in the Global South may be too opti-

mistic in the short term, possibilities such as these should, to a greater extent, be taken into account in debates on how to promote participatory development. And for commodity chains, increased transparency could be achieved even without a wholesale shift in the paradigm of development. With relatively simple technology, marginalized communities can contribute information on labor and environmental conditions of production taking place in their vicinity.

Despite the openness and accessibility of wikis, there remain key barriers for marginalized communities. A core characteristic of wikis is that they still necessitate agreement and ultimately only present one representation of any place, process, or thing. Any object or node on a commodity chain can thus only be presented in one way (see Figure 4). So, on any topic or any node of any commodity chain, there is the visible information that gets included and the invisible information that gets excluded. Disagreement and debate about visible content is therefore a necessary feature of wikis, and within those debates, there are always winners and losers.
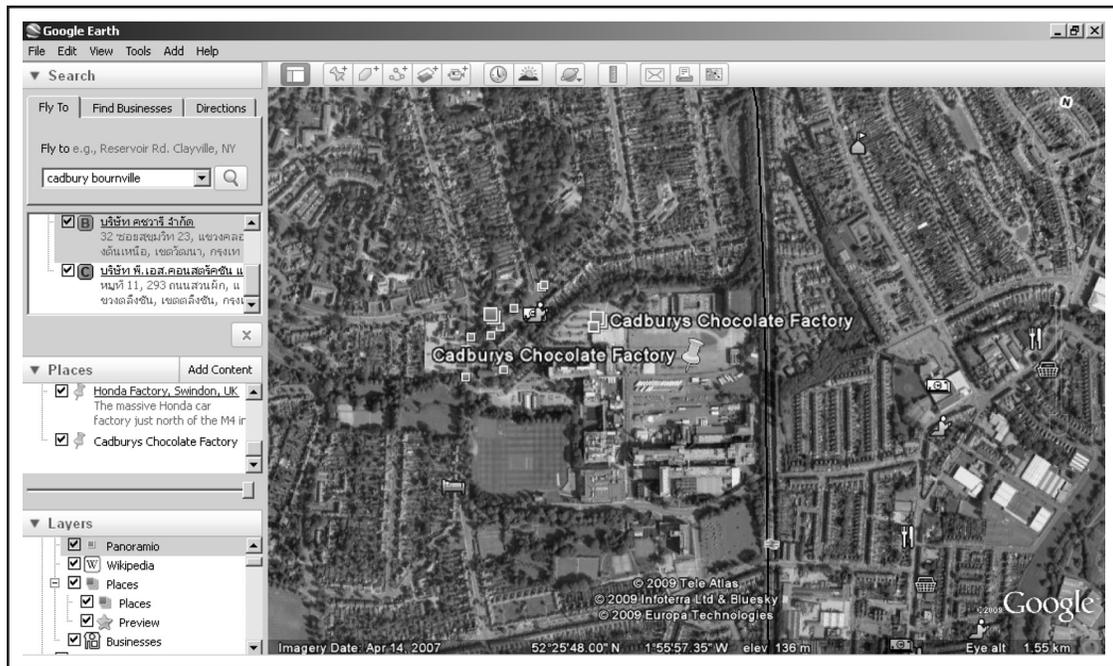
Figure 5. An Example of the Search Model. Source: Screenshot of Google Earth.

Research on Wikipedia, for instance, has shown that not only are a tiny minority of users the creators of most content,[7] but that methods employed to resolve disagreements are frequently opaque and usually favor distinct demographics—for example, young Western males (O'Neil, 2009).

Centralized search systems like Google Earth offer a fundamentally different way of organizing information. Multiple representations of the same nodes on chains can coexist on the Internet by tagging information to specific points on a chain (or the Earth). In Figure 5, for example, multiple representations can be tagged to the Cadbury factory in Bourneville, England, without any need for agreement about which is the most correct or accurate. Using a centralized search system instead of a wiki to search through masses of data means that multiple representations of any node can exist, and there is no need for consensus. Thousands of sources could potentially be tagged to any node on any chain, allowing for multiple simultaneous representations. However, not all information tagged to any

node is equally visible or accessible. Nodes containing rich layers of information necessitate sorting, ordering, and ranking systems that are inherently hierarchical. Research has shown that ranking systems inevitably promote already highly visible parts of the Internet to highly visible positions and assign less visible parts of the Internet to marginal positions in the rankings. Languages and cultures with large Internet presences (e.g., the UK and the United States) are also likely to have higher ranks. Ranking algorithms thus essentially become a governance system for the Internet (Zook & Graham, 2007a, 2007b).

These two examples illustrate that even if the Internet of Things and Web Squared could bring together a critical mass of data about global commodity chains, the power relationships built into any system would still serve to make some information visible at the expense of other information. A state of ubiquitous information, as represented in Figure 5, is unlikely to ever come into being due to the distinct geographies of user-created content (e.g.,

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7. Only about 1/10th of 1% of Wikipedia users are actually regular contributors.

Total number of geotagged Wikipedia articles per country in all languages

0 - 1000	10001 - 25000
1001 - 5000	25001 - 50000
5001 - 10000	> 50000

Data obtained from Wikipedia geodata dump in Nov 2009. More maps and analysis available at geospace.co.uk and floatingsheep.org Mark Graham, Oxford Internet Institute.
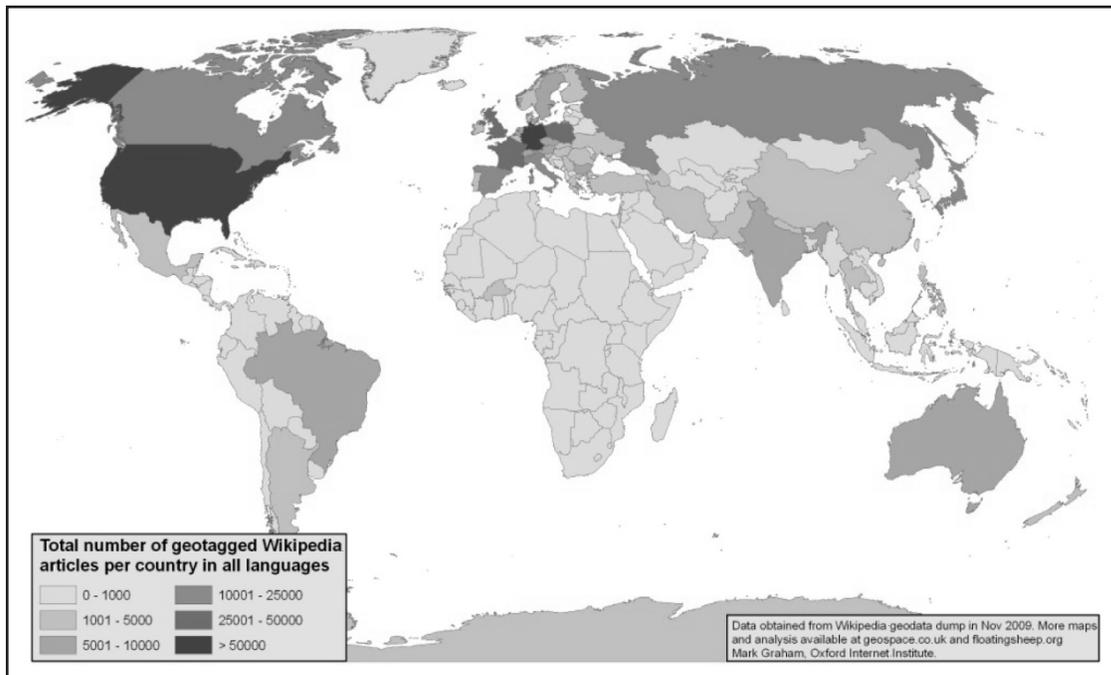
Figure 6. Map of Content in Wikipedia. Source: Mark Graham.

the enormous degrees of unevenness in user-generated content on Wikipedia, as illustrated in Figure 6). Because such a model of information flow relies on the citizen as a sensor, both to fill in the gaps left uncovered by RFID tags and IP addresses, and to create a layer of information that is global in scope, the distinct geographical biases to the peer production of information can contribute to the continuing opacity of information flow about nodes in commodity chains.

The information shadows of objects will thus always be densest in the most highly networked parts of the world. Studies of ICTs in development have identified a range of barriers to implementation, challenging the feasibility of "transferring" generic technical know-how into developing countries and their organizations with the expectation that it will result in the same organizational practices and outcomes as in their context of origin (Avgerou, 2008). While it is conceivable for a critical mass of people in the Global North to act as sensors for the Internet of Things, it remains unrealistic to expect Bangladeshi textile workers, coffee growers in Papua, New Guinea, Kenyan flower pickers, or most of the rest of the world to act as networked sensors,

when most workers at those sites of production possess neither the knowledge nor the resources to be able to fulfill that role for the digital world. The degree to which actors in the South are participating in articulating the critical narratives on global production is thus unclear. Furthermore, possibilities for effective use of ICTs in encouraging ethical consumption also hinge on the intelligent capture and use of commodity chain information in the Global North.

It should be stressed that it is primarily activist consumers who can be expected to make use of and act on information about conditions of production. But given the rapid increase in the availability, quantity, and quality of information, it is not unlikely that groups of ethically oriented consumers will make use of this information to a sufficient degree to create incentives for producers to either rethink production practices, or to yield to demands for improved working conditions. Infomediaries can potentially create a feedback mechanism in this respect by spotlighting particularly unsavory production practices of brands, further influencing more consumers to access and act on information about distant nodes on commodity chains. The compla-

cency of most consumers in the Global North remains one of several barriers to achieving progressive change through commodity chain transparency. These barriers ultimately mean that technological possibilities are, by themselves, a necessary, but not sufficient, condition for increased transparency in commodity chains.

At the same time, technological possibilities discussed in this article can potentially make a difference if they are embedded in broader processes of local capacitation, infrastructure development, democratization, and social change. Meaningful participation in Wikis and the generation of information does not require an excessive amount of technological competence or social organization on the part of actors in the Global South. Through an incremental process embedded in infrastructure improvement, local capacitation, and linkages to other communities and activists in the North, these possibilities could viably empower actors in the South to contribute to a new politics of consumption and production.

In summary, the potentials of practices and frameworks for user-generated content being employed to increase the transparency of commodity chains are conditioned by the following factors:

- Infrastructure and access: the physical technological infrastructure available in the Global South and the access of marginalized communities to its use;

- Actors' capacities for meaningful data generation and data entry: the ability of actors in communities in the South to develop the capabilities needed to contribute to peer-to-peer generation of information;

- The continued role of, and control over, infomediaries: ownership and power relations embedded in organizations and commercial media, as well as the influence of these in communication and information exchange; and

- Intelligent capture and use by consumers: the ability of consumers to process and act on information.

6. Conclusions

By globalizing knowledge, the Internet of Things and the peer production of information offer an opportunity to empower marginal individuals and communities throughout the Global South. Transnational corporations would no longer be able to conceal poor production practices and exploitative labor conditions behind the veils of distance that have, for so long, separated the sites of production and consumption. As Web Squared and the Internet of Things alter the opacity of distance, and as knowledge about sweatshops, child labor, exploitation, and environmental damage becomes widely accessible on a computer or mobile phone, radical shifts in the possibilities for development present themselves. Actors in the Global South would have a venue to communicate their knowledge and experience of labor and environmental conditions. Consumers in the Global North would be able to better distinguish between the many glossy (and often exaggerated) claims made by TNCs regarding the benefits they provide to workers in the developing world, having gathered enough information to identify those commodities and chains which truly do result in tangible benefits to producers in the Global South.

However, as many commentators have already noted, the Internet also replicates the structures of class and power of the societies in which it is embedded (Warf, 2001). A variety of factors will contribute to the continuing opacity of information flow about nodes in commodity chains. In the case of wikis, for instance, methods employed to resolve disagreements are frequently less than transparent, and they often favor distinct demographics, particularly that of young white males (O'Neil, 2009). Control of information continues to characterize much of the technology behind the Internet of Things, and large amounts of data being created through cloud collaboration are often subject to a variety of licensing restrictions, as a majority of Web 2.0 sites are run by for-profit companies (Graham, in press[b]). The incorporation of everyday objects into a corporate-controlled Internet of Things raises a plethora of concerns, such as those about privacy (Phillips, 2003), surveillance, black holes of information, bias, and geoslavery (Dobson & Fisher, 2003).

Further, if people are to act as networked sensors, this necessarily involves only those with the resources, capabilities, and skill sets to do so. At the moment, this excludes large segments of people in the Global South. While Internet use in the Global South is increasing rapidly, the Internet and practices of content generation will continue to be character-

ized by geographical and topological black holes. Access is also a broader issue than just one of infrastructure. Wikis and search engines contain embedded assumptions, laws, and power relations that prevent some information from becoming visible, yet highlight other information. Realization of the potential transparency depends not only on technological infrastructures, but on how they are utilized by social practices seeking to invigorate a politics of consumption. In turn, realizing the potential for a peer-to-peer generation of information on commodity chains that includes the Global South is dependent on access being conceived of as embedded in broader processes of development "on the ground": local capacitation, building of infrastructure, democratization, and social change.

This article has argued that, in place of imagination of ubiquitously available information about any product, anywhere, and addressable on the Internet, as well as in real life, it is important to note that there will always be nodes on many chains that are kept invisible. Peer production and the networking of everyday objects will, in many ways, allow for greater spotlighting of nodes on chains that would otherwise remain cloaked and invisible. However, it remains important to continuously question the invisibility of particular nodes, the geographies of information creation, and the politics of ranking and visibility, rather than to uncritically imagine that technologies have brought about a global village of universally accessible information. ∎

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