From the Guest Editors[1]

Open Development: A New Theory for ICT4D[2]

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Open development refers to an emerging set of possibilities to catalyze positive change through "open" information-networked activities in international development. While there is evidence to support the observation that these changes could be coming, we are only now beginning to glimpse their potential for developing societies. Consequently, embedded in this theory are a high level research question and hypothesis. The research question asks how these information-networked activities work, in what circumstances, and to whose benefit? The hypothesis states that these new models of networked activities can lead to development outcomes that are both inclusive and transformative.

The theory of open development emerged through observation and experience. The importance of openness for ICT4D came to light following a long day of meetings at a secluded farm near London, Ontario in 2008. Many of the participants had been grappling with the future of ICT4D, and after having drawn an issue map, participants had an "ah ha" moment. The issue of "openness" in IT systems, policy, and development sectors seemed to permeate every element of our (IDRC) ICT4D programming. From access to use, and from content to creation, it appeared that some form of openness was a component of much of the research we supported, including open participation in use, open licensing to provide services, open content, open source, and open government.

Openness is, however, perhaps a better marketing term than analytic concept. Its fuzziness and current trendiness make it susceptible to multiple interpretations and co-option by actors who subscribe to a range of positions and ideologies. For example, openness is used to describe unfettered markets, but it also describes, for others, the justification of state support for maintaining access to public goods. Others have even seen the underlying "open source" ethos, which questions principles of ownership, as akin to socialism.

In this special issue, we differentiate ourselves from these perspectives. We are concerned with open *development;* i.e., openness that serves the purpose of *development,* not openness for openness' sake. But let's not get ahead of ourselves; first we must be clear about what openness and open development mean.

Open Development

The seeds of open development were planted in the earliest designs of the Internet, with its open standards and sharing culture (Castells, 2001a), alongside the emergence of open source "thinking" and longstanding development concepts like democracy, participation, and inclusion. The success of

1. Ben Petrazzini also acted as a co-editor for this special issue.

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early open source applications and favorable technological advances have encouraged similar social innovations, such as those in government (open government data), research (open access), education (open educational resources), and business (open business models), to name a few.

The term "open" is shorthand for information-networked activities that have, relatively speaking, more information that is freely accessible and/or modifiable and more people who can actively participate and/or collaborate. It is not new to suggest that we are moving toward a "network society" (Benkler, 2006; Castells, 2001a). Arguably, the fundamental unit of society has always been social networks of a sort (e.g., families, communities, cities, institutions, governments). What is new about the network society is that "key social structures and activities are organized around electronically processed information networks" (Castells, 2001b). As illustrated above in the list of open activities, we are living at a time when information networks are broadening (access to and inclusion in), deepening (more information flows, higher quantity and quality of interactions), and increasing in relevance. Critically, these networks take on new forms that alter how we (people, groups, governments, etc.) mobilize and organize resources (information and people) to achieve desired ends. In general, these new forms are less hierarchical than their predecessors, and they also bring certain advantages.

There are many examples. Crowdsourcing illustrates social production in domains that were previously dominated by experts, such as peer review of academic articles,[3] the verification of mathematical proofs (Markoff, 2010), crisis mapping, and election monitoring (Banks, 2007). Collaborative production can benefit many domains, as it has in the development of biotechnologies following open source principles (Masum et al., this issue), or potentially, as a means to promote ethical consumption (Graham & Haarstad, this issue). Similarly, the low cost of online publishing has meant that anyone with access to an Internet connection can be a publisher. In the United States, one man began recording very high-quality, clear, and concise educational courses and placed them online. Eventually, he started the Khan Academy,[4] an NGO that seeks to be the world's first free classroom for the world. He has produced over 1,400 videos, and volunteers are now translating the videos into other languages. New media tools such as blogs, YouTube, and Twitter have had an effect on political action around the world. Although the extent of this impact is not well understood (Aday et al., 2010), examples abound.

These novel information networks are also beginning to change how international development itself is conducted. This change has been coined "development 2.0" by some (Quaggiotto & Wielezynski, 2007; Thompson, 2008; Heeks, 2010), although the full extent of this change is yet to be realized and understood. ICTs and Web 2.0 are a rapidly expanding range of possibilities for engaging in participatory methodologies (Chambers, 2010). The models of how and from where innovations might emerge are shifting (Heeks, 2008; von Hipple, 2005). For example, recently, the World Bank opened up their data to the world in a manner that allows for easy access and combinations (mashups).[5] Also, it provides a new level of transparency of the aid industry which was not previously possible, and recent research seems to indicate that donor transparency has the positive impact of reducing recipient corruption levels (Christensen et al., 2010).

The dynamic also raises new challenges. For example, who do donors fund if they want to support a decentralized loose network of social change actors (Bernholz et al., 2010)? New modalities of funding are required. Furthermore, as the speed of change is accelerated by new technologies, the donor

3. See, for example, Bloom (2006); Cohen (2010); Greaves et al. (2006); Howard (2010).
4. See http://www.khanacademy.org/
5. See http://data.worldbank.org/

and philanthropic communities must embrace the implications of dealing with the complexity involved in fostering change through networks of people.[6] For example, development planning requires the flexibility, critical thinking, and situational awareness to respond to emergent issues, as well as appropriate accountability arrangements that can handle this adaptability (Patton, 2010).

Of course, there are plenty of negative examples, a "dark side" of openness (Smith & Elder, 2010), as the expansion and deepening of networks comes with risks and challenges. For example, the pervasiveness of the Internet and Web 2.0 applications also implies that an ever-greater amount of information on people is shared and stored by both the private and public sectors, raising issues around citizens' right to privacy and who controls personal information (Mayer-Schonberger, 2009). There are many such issues, and they should not be taken lightly.

Disruptive Transformation

Open development, as conceptualized here, necessarily involves a process that alters *who* is able to participate in development activities. The open development hypothesis suggests that positive development can emerge through new models of engagement and innovation that are more participatory, more collaborative, and driven more by the beneficiaries. Lower costs of entry mean that those who might have been otherwise motivated but had earlier lacked sufficient knowledge or resources can now mobilize (Hagel et al., 2010).

Such a shift is both practical and cultural. Practically, it involves ensuring that any open development initiative is true to its goals of facilitating greater participation and inclusion, and that it provides the necessary resources to remain true to those goals. Open development initiatives may consist of a superficial veneer that hides less inclusive intentions and systems (Buskens, this issue). It is no surprise, then, that two articles in this special issue stress the need for reflexive and honest researchers and practitioners to engage in a truly open and inclusive manner (see both Buskens and Harvey, this issue). Culturally, inbuilt assumptions and values are also shifting. Testing the open development hypothesis necessitates an overdue conceptual shift from viewing the "poor" as passive consumers to seeing them as active producers and innovators (Heeks, 2009; Liang, 2010). It also signifies a general movement in the central organizing principle of society away from competition and toward collaboration, as well as the concurrent adjustment of motivations and incentives that underlie such activities.

This process also shifts power and control; truly inclusive and participatory open development initiatives push for disruptive transformation (Avgerou, 2010), contesting power relationships and the status quo. The new models of information network organization that underlie open development are ultimately a direct challenge to contemporary models of production, ownership, and control. In particular, these models can threaten the interests of many of the private sector actors who have played a role in the history of ICT4D (Unwin, in press). A political economy lens is necessary if we are to understand the contours and dynamics of changes taking place in the networked society.

By way of example, we illustrate some ongoing battles that are being fought over control of both digital content and the networks on which the content passes. The battle over ownership and control of digital content is in the area of intellectual property (IP) rights. Many computer science pioneers were ardent believers in the idea that computing could only get better if you were free to copy and improve upon existing work. Consequently, the idea of open source software, and later, of open source licensing, of which the general public license (GPL) was the first example, came to be. This turned the pre-

6. See, for example, Chambers (2010), who writes about a new paradigm called adaptive pluralism.

dominant notion of intellectual property on its head, since a patent had been created that ensured the product would be in the public domain. Others then expanded the idea to creative goods that would otherwise fall under the domain of copyright by developing licenses like the Creative Commons. This was a response to the fact that companies active in creative and software industries were both fighting to have governments put tougher IP laws in place, and installing digital rights management technology on their goods to protect them. This was, in turn, a reaction to the threat of digital technologies' abilities to infinitely reproduce goods at no or very low cost.

This focus on IP results in policy debates between those who support reforming IP law or expanding fair use provisions, and those who want to expand the protection of IP to maximize monopoly rents and deter digital piracy, a main threat to those rents. This debate takes on added complexity when trade interests are taken into account, seeing as most developed nations make important profits through exporting IP in digital products, whereas developing countries are mostly net importers. Another interesting battlefield where crucial matters of openness are being fought over is related to the Internet itself. The Internet is built on a platform that ensures all packets of data are treated the same. This neutrality is a key strength of the Internet, and it has played an important role in ensuring its growth. However, various factors have been threatening this openness. First, the net neutrality debate has brought to the fore the ability of Internet providers to shape Internet traffic and favor some content and services over others (Bar et al., 2008). Although some question the extent of this threat outside of the United States,[7] the fact that most of the developing world will access the Internet through mobile phones may make this more of an issue there than in the developed world.

Mobile service providers have tended to be much greater gatekeepers of Internet provision, due in part to the centralized nature of mobile networks, and to limited wireless bandwidth, with its subsequent challenges for quality of service (Zuckerman, 2010). As the dominant players, mobile operators consolidate their power through increased market share, and they are therefore beginning to resist more open and liberal telecommunications policies (Melody, 2010). Another threat to the Internet's openness has been the ability of governments to exert influence on Internet service providers in the form of censorship or content filtering. Finally, some consider that social networking applications, such as Facebook or Twitter, as well as apps on smart phones or tablets, are also challenging the openness of the Internet (Anderson & Wolff, 2010). Through the creation of walled gardens, where a company chooses how to store and handle personal data, or which apps can be downloaded or not, potentially a more segmented, less interoperable, and more commercially dominated Internet is upon us.

This disruptive transformation focus serves as an important reminder that is not a foregone conclusion that openness will necessarily benefit the disempowered and marginalized; indeed, one might anticipate that, in times of transition, those with the resources to take advantage of the situation would benefit most. This happens both at the macro level, with actors such as the mobile operators, as well as on more local levels. For example, a study in Bangalore showed how the increase of open data (digitization of land records) led to large land capture by the already rich and empowered, rather than benefiting the poor and disempowered (Benhamin et al., 2007).

The Special Issue

A key point emerging from the above discussion is that *arguments promoting openness should always be critically questioned,* in the same way that arguments for defending more closed systems should

7. See Economist *(2010).*

be. Consequently, we remain agnostic and pragmatic as to the open policy/practice prescriptions; the focus is on what works for *development,* rather than pushing a particular model or policy.

To connect openness to development, these models need to be studied and understood in both their particular instances in different domains (e.g., health, education, government), as well as in the development context in which they are situated. We need to know how, and in what circumstances, such models are both sustainable and transformational. For example: Does open access to scientific papers bring wider dissemination?[8] In what situations and for what type of data does government transparency result in improved accountability and government performance?

We are pleased to have the opportunity to present this special issue on open development that seeks to begin providing insight into the relevance of open development. The content of this special issue comes from two sources. The first set come from a call for papers and workshop sponsored by the International Development Research Centre in May 2010. The call was seeking papers that spoke to the following questions:

- How does (or might) increased access to information networks and communication possibilities, as well as new forms of participation and collaboration, result in social, economic, and political development?
- What are the possible downsides and risks of expanding openness in the cultural, social, economic, and political spheres, and how can we mitigate them?

We received more than 80 abstracts for the call, of which 21 were selected, with 20 papers being finally written. All 20 papers were revised through a double-blind peer-review process. Six of these papers were then chosen by the special issue co-editors to submit for this issue. One paper had already been submitted for publication in an alternative journal and therefore was excluded. The rest were put through the standard *ITID* review process, and were eventually accepted.

The Forum piece by Ineke Buskens was an invited submission. The author was asked to reflect on the potential of openness for development from a gender perspective. It also underwent the standard *ITID* review process.

We are excited by these articles, which collectively represent a first foray into exploring open development. We hope you enjoy the special issue!

References

Aday, S., Farrell, H., Lynch, M., Sides, J., Kelly, J., & Zuckerman, E. (2010). *Blogs and bullets: New media in contentious politics.* Washington, DC: United States Institute of Peace.

Anderson, C., & Wolff, M. (2010, August 17). The web is dead. Long live the internet. *Wired,* Retrieved January 28, 2011, from http://www.wired.com/magazine/2010/08/ff_webrip/

Avgerou, C. (2010). Discourses on ICT and development. *Information Technologies & International Development, 6*(3), 1–18. USC Annenberg Press.

Banks, K. (2007). And then came the Nigerian elections: The story of FrontlineSMS. *Suati, Stanford Journal of African Studies, 4,* 1–4.

Bar, F., Baer, W., Ghandeharizadeh, S., & Ordonez, F. (2008). Infrastructure: Network neutrality and network features. In K. Varnelis (Ed.), *Networked publics.* Cambridge, MA: The MIT Press.

8. See National Science Foundation (2009).

Benhamin, S., Bhuvaneswari, R., & Manjunatha, P. R. (2007). Bhoomi: 'E-Governance,' or, An anti-politics machine necessary to globalize Bangalore? A CASUM-m working paper.

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom.* New Haven, CT: Yale University Press.

Bernholz, L., Skloot, E., & Varela, B. (2010). *Disrupting philanthropy: Technology and the future of the social sector.* Center for Strategic Philanthropy and Civil Society, Sanford School of Public Policy, Duke University.

Bloom, T. (2006). The Internet is allowing much more interactive science publishing. *Nature,* 444. Available at: http://www.nature.com/nature/peerreview/debate/nature05030.html

Castells, M. (2001a). *The Internet galaxy.* New York: Oxford University Press.

Castells, M. (2001b). *The network society and organizational change.* Conversations with History; Institute of International Studies, UC Berkeley. Retrieved January 28, 2011, from http://globetrotter.berkeley.edu/people/Castells/castells-con4.html

Chambers, R. (2010). Paradigms, poverty and adaptive pluralism. Institute of Development Studies, University of Sussex, *IDS Working Paper No. 344.* Available at: http://onlinelibrary.wiley.com/doi/10.1111/j.2040-0209.2010.00344_2.x/pdf

Christensen, Z., Nielsen, R., Nielson, D., & Tierney, M. (2010, November 12–13). Transparency squared: The effects of aid transparency on recipients' corruption levels. Presented at the International Political Economy Society Conference, Cambridge, MA.

Cohen, P. (2010, August 23). Scholars test web alternative to peer review. *The New York Times.* Available at: http://www.nytimes.com/2010/08/24/arts/24peer.html?_r=2

Economist. (2010, September 2). *The Web's new walls: How the threats to the Internet's openness can be averted.* Retrieved January 28, 2011, from http://www.economist.com/node/16943579?story_id=16943579

Greaves, S., Scott, J., Clarke, M., Miller, L., Hannay, T., et al. (2006). Overview: Nature's peer review trial. *Nature,* 444. Available at: http://www.nature.com/nature/peerreview/debate/nature05535.html

Hagel III, J., Brown, J. S., & Davison, L. (2010). *The power of pull: How small moves, smartly made, can set big things in motion.* New York: Basic Books.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ICT for international development. *IEEE, 41*(6), 78–85.

Heeks, R. (2009). The ICT4D 2.0 manifesto: Where next for ICTs and international development. Development Informatics Group, University of Manchester, *IDPM Working Paper No. 42.* Available at: http://www.sed.manchester.ac.uk/idpm/research/publications/wp/di/di_wp42.htm

Heeks, R. (2010). Development 2.0: Transformative ICT-enabled development models and impacts. *Communications of the ACM, 53*(4), 22–24.

Howard, J. (2010, July 26). Leading humanities journal debuts 'open' peer review, and likes it. *The Chronicle of Higher Education.* Available at: http://bit.ly/hMSszt

Liang, L. (2010). Access beyond developmentalism: Technology and the intellectual life of the poor. *Information Technologies & International Development, 6*(Special Edition), 65–67.

Markoff, J. (2010, August 16). Step 1: Post elusive proof. Step 2: Watch fireworks. *The New York Times.* Retrieved January 28, 2011, from http://www.nytimes.com/2010/08/17/science/17proof.html?_r=4&scp=1&sq=markoff%20theorists%20&st=cse

Mayer-Schonberger, V. (2009). *Delete: The virtue of forgetting in the digital age.* Princeton, NJ: Princeton University Press.

Melody, W. (2010). Openness: The central issue in telecom policy reform and ICT development. *Information Technologies & International Development, 6*(Special Edition), 89–91.

National Science Foundation. (2009). Open access to scientific papers may not guarantee wide dissemination. Retrieved January 28, 2011, from http://www.nsf.gov/news/news_summ.jsp?cntn_id=114225&org=NSF&from=news

Patton, M. Q. (2010). *Developmental evaluation: Applying complexity concepts to enhance innovation and use.* New York: The Guilford Press.

Quaggiotto, G., & Wielezynski, P. (2007). Development 2.0: A new paradigm for the non-profit sector? *FreePint,* Newsletter No. 230. Available at: http://web.freepint.com/go/newsletter/230#feature

Smith, M. L., & Elder, L. (2010). Open ICT ecosystems transforming the developing world. *Information Technologies & International Development, 6*(1), 65–71.

Thompson, M. (2007). ICT and development studies: Towards development 2.0. *Journal of International Development, 20*(6), 821–835.

Unwin, T. (forthcoming). The Internet and development. In W. Dutton (Ed.), *The Oxford handbook of Internet studies.* Oxford, UK: Oxford University Press.

Von Hippel, E. (2005). *Democratizing innovation.* Cambridge, MA: MIT Press.

Zuckerman, E. (2010). Decentralizing the mobile phone: A second ICT4D revolution? *Information Technologies & International Development, 6*(Special Edition), 99–103.

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

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.

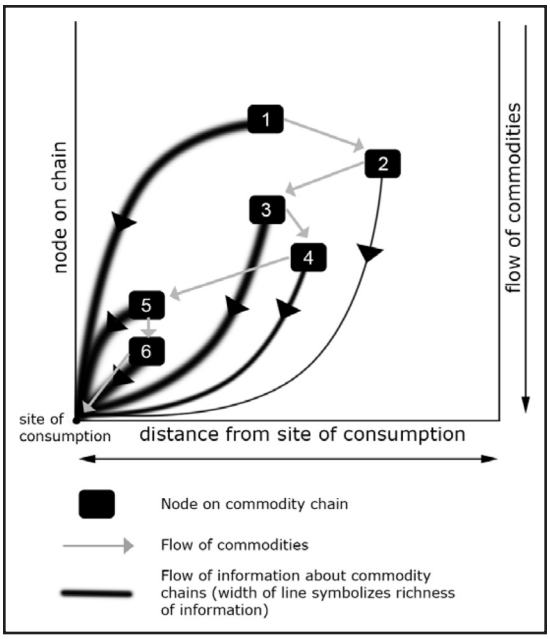

Figure 1. Simplified Representation of Flows of Information About Nodes on a Commodity Chain.[2] Source: Authors.

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

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.

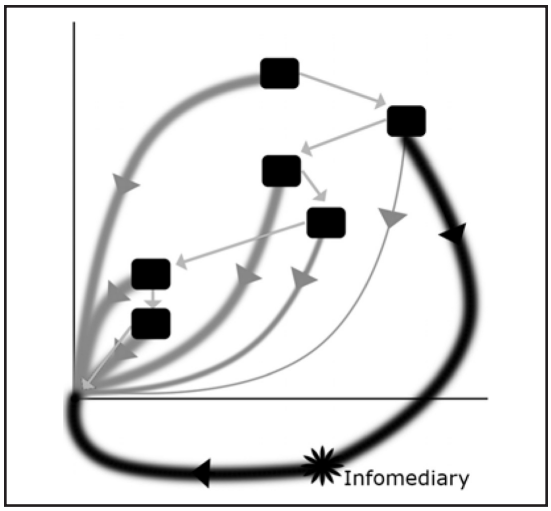

Figure 2. Altered Flows of Information Due to Media Interventions. Source: Authors.

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 "internetworked 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 "alterglobalization 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

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 intelligent 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

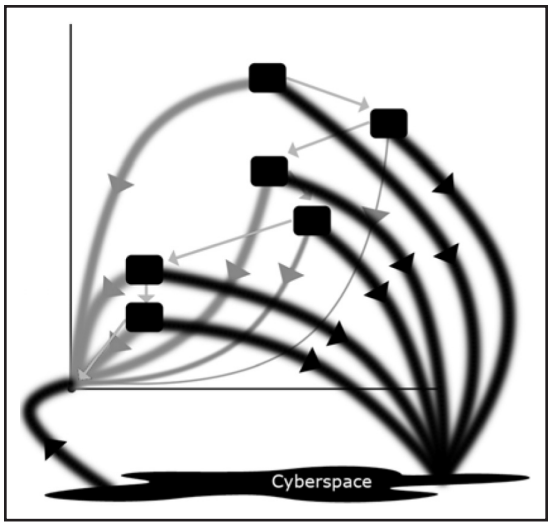

Figure 3. "Web Squared" and Ubiquitous Information. Source: Authors.

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

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-

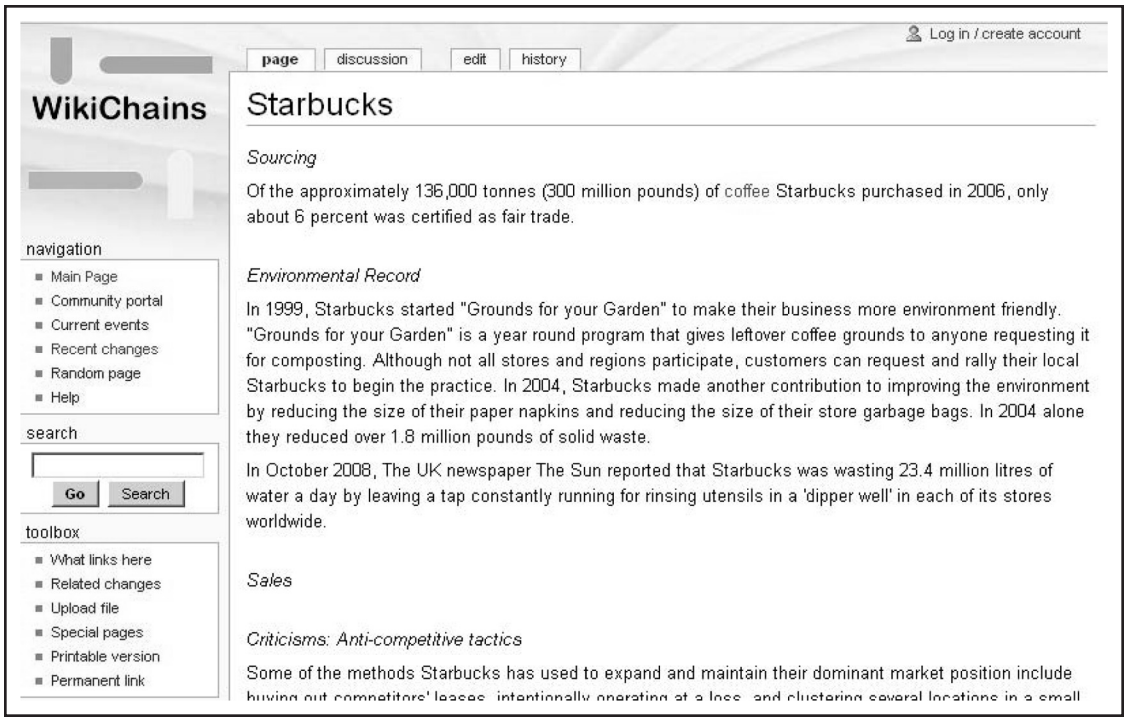

Figure 4. An Example of a Wiki Page. Source: http://wikichains.com/en.wiki/index.php/Starbucks

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 optimistic 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.

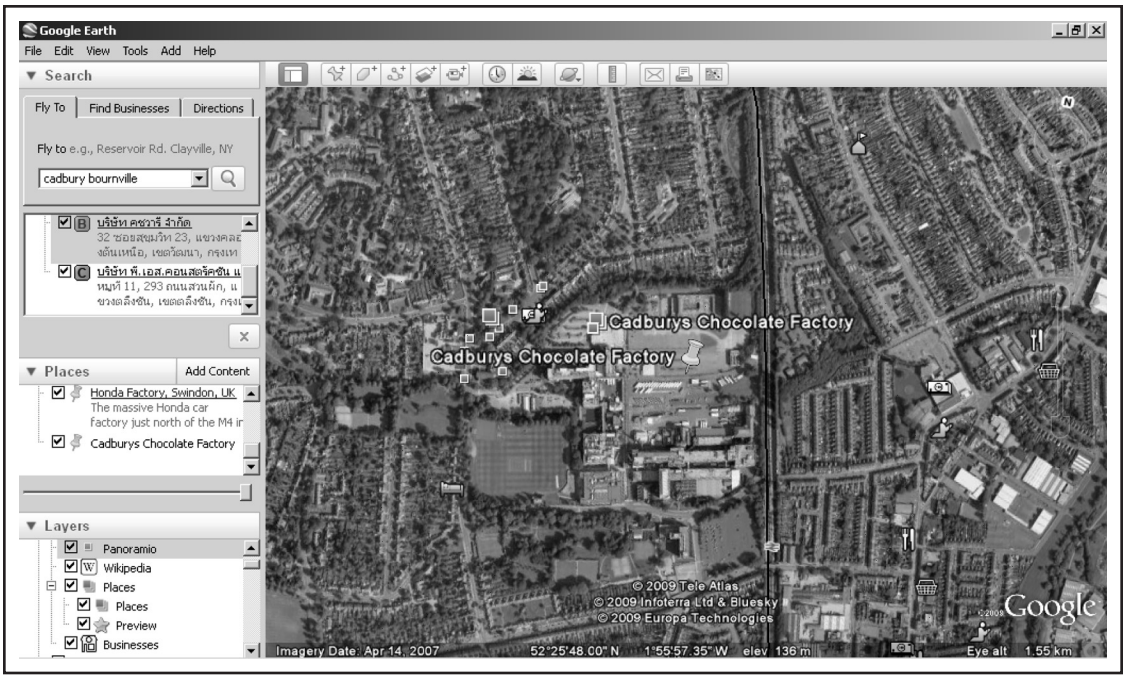

Figure 5. An Example of the Search Model. Source: Screenshot of Google Earth.

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.,

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

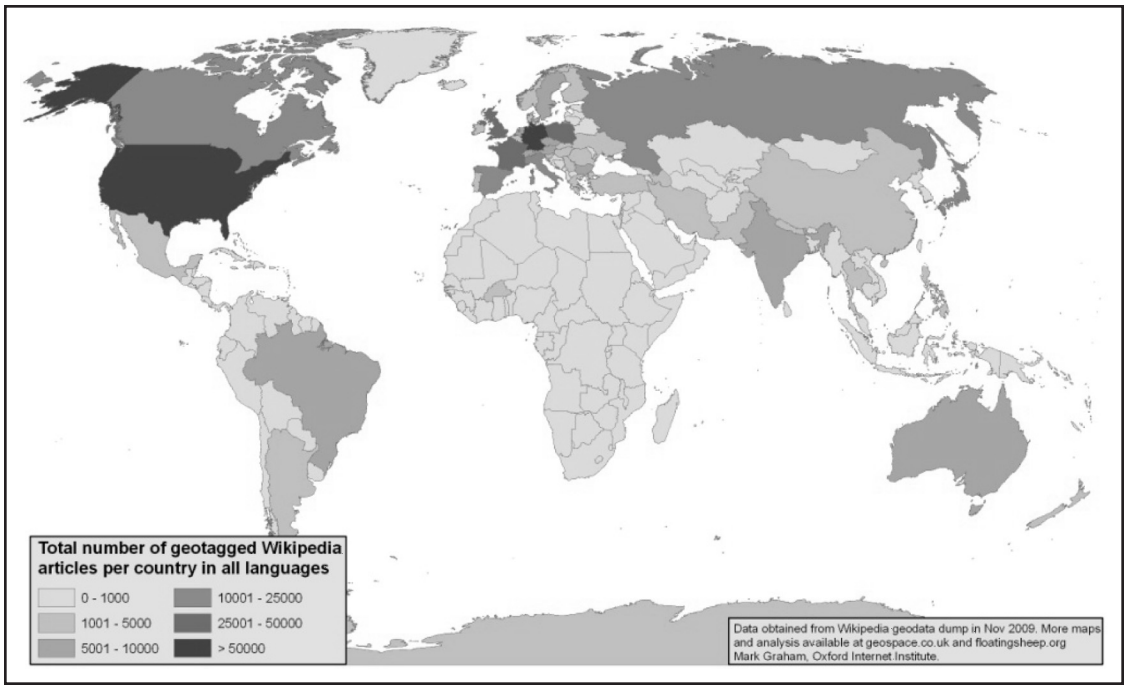

Figure 6. Map of Content in Wikipedia. Source: Mark Graham.

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. ■

References

Adams, P. C., & Ghose, R. (2003). India.com: The construction of a space between. *Progress in Human Geography, 27*(4), 414–437.

Ashman, S. (2004). Resistance to neoliberal globalization: A case of militant particularism? *Politics, 24*(2), 143–153.

Audretsch, D. B., & Feldman, M. P. (1996). R&D spillovers and the geography of innovation and production. *The American Economic Review, 86*(3), 630–640.

Avgerou, C. (2008). Information systems in developing countries: A critical research review. *Journal of Information Technology, 23*(3), 133–146.

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

Biddlecombe, E. (2005). UN predicts Internet of Things. Retrieved July 6, 2009, from http://news.bbc.co.uk/1/hi/technology/4440334.stm

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

Butler, D. (2006). 2020 computing: Everything, everywhere. *Nature, 440*(7,083), 402–405.

Cairncross, F. (1997). *The death of distance: How the communications revolution will change our lives.* Cambridge, MA: Harvard Business School Press.

Castree, N., Featherstone, D., & Herod, A. (2008). Contrapuntal geographies: The politics of organizing across sociospatial difference. In K. Cox, M. Low, & J. Robinson (Eds.), *The Sage handbook of political geography* (pp. 305–321). London: SAGE Publications.

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

Clarke, A. N. (2003). *Dictionary of geography.* London: Penguin.

Couclelis, H. (1996). Editorial: The death of distance. *Environment and Planning B: Planning and Design, 23,* 387–389.

Dobson, J. E., & Fisher, P. F. (2003). Geoslavery. *IEEE Technology and Society Magazine, Spring,* 47–52.

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

Dodge, M., & Kitchin, R. (2001b). *Mapping cyberspace.* London: Routledge.

Dodge, M., & Kitchin, R. (2005). Codes of life: Identification codes and the machine-readable world. *Environment and Planning D: Society and Space, 23,* 851–881.

Dodson, S. (2004, October 9). The Internet of Things. *The Guardian.* Retrieved October 22, 2010, from http://www.guardian.co.uk/technology/2003/oct/09/shopping.newmedia

Dodson, S. (2005, October 3). Worldwide wikimania. *The Guardian Unlimited.* Retrieved October 22, 2010, from http://www.guardian.co.uk/technology/2005/aug/11/onlinesupplement2

Dodson, S. (2008, October 16). The Net shapes up to get physical. *The Guardian.* Retrieved October 22, 2010, from http://www.guardian.co.uk/technology/2008/oct/16/internet-of-things-ipv6

Dunning, J. H. (1993). *Multinational enterprises and the global economy.* Wokingham, UK: Addison-Wesley.

Eldridge, J. D., & Jones, J. P. (1991). Warped space: A geography of distance decay. *Professional Geographer, 43*(4), 500–511.

Feldman, M. (1994). *The geography of innovation.* Dordrecht, Netherlands: Kluwer.

Ferguson, T. (2002). Have your objects call my object. *Harvard Business Review, June,* 1–7.

Fong, C. (2008). Internetting every thing, every where, all the time. Retrieved October 22, 2010, from http://edition.cnn.com/2008/TECH/11/02/digitalbiz.rfid/

Foster, W. (n.d.). ISO–14000 environmental standards and e-commerce. Retrieved October 22, 2010, from http://www.fosterandbrahm.com/docs/ISO14000.pdf

Fraser, N. (1990). Rethinking the public sphere: A contribution to the critique of actually existing democracy. *Social Text, 25/26,* 56–80.

Gereffi, G. (2005). The global economy: Organization, governance, and development. In N. J. Smelser & R. Swedberg (Eds.), *The handbook of economic sociology* (pp. 160–182). Princeton, NJ: Princeton University Press.

Gershenfeld, N., Krikorian, R., & Cohen, D. (2004). The Internet of Things. *Scientific American, October,* 76–83.

Gillespie, A., & Williams, H. (1988). Telecommunications and the reconstruction of regional comparative advantage. *Environment and Planning A, 20,* 1,311–1,321.

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

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

Graham, M. (in press[b]). Cloud collaboration: Peer-production and the engineering of the Internet. In S. Brunn (Ed.), *Engineering Earth* (pp. 67–83). New York: Springer.

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., & Zook, M. A. (in press). Visualizing global cyberscapes: Mapping user generated placemarks. *Journal of Urban Technology.*

Greenfield, A. (2006). *Everyware: The dawning age of ubiquitous computing.* Berkeley, CA: Peachpit Press.

Haarstad, H. (2007). Collective political subjectivity and the problem of scale. *Contemporary Politics, 13*(1), 57–74.

Harvey, D. (2000). *Spaces of hope.* Berkeley and Los Angeles: University of California Press.

Hayes, B. (1997). The infrastructure of the information infrastructure. *American Scientist, 85*(3), 214–218.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ICT for international development. *Computer, 41*(6), 26–33.

Hopkins, T. K., & Wallerstein, I. (1994). Commodity chains in the capitalist world economy prior to 1800. In G. Gereffi & M. Korzeniewicz (Eds.), *Commodity chains and global capitalism* (pp. 17–50). London: Greenwood Press.

Illia, L. (2003). Passage to cyberactivism: How dynamics of activism change. *Journal of Public Affairs, 3*(4), 326–337.

International Telecommunication Union (ITU). (2005). *The Internet of Things.* Geneva: United Nations.

Jafe, A. B., Trajtenberg, M., & Henderson, R. (1993). Geographic localization of knowledge spillovers as evidenced by patent citations. *Quarterly Journal of Economics, 108*(3), 577–598.

Jennings, C. (2008, December 22). The cloud computing revolution. *Computer Weekly.* Retrieved October 22, 2010 from http://www.computerweekly.com/Articles/2008/12/22/234026/The-cloud-computing-revolution.htm

Jhally, S. (Writer/Director), & Garner, K. (Producer). (2003). *No logo: Brands, globalization & resistance.* (Documentary) USA: Media Educational Foundation.

Kahn, R., & Kellner, D. (2004). New media and Internet activism: From the Battle of Seattle to blogging. *New Media & Society, 6*(1), 87–95.

Kavada, A. (2005). Civil society organizations and the Internet: The case of Amnesty International, Oxfam and the World Development Movement. In W. de Jong, M. Shaw, & N. Stammers (Eds.), *Global activism, global media* (pp. 208–222). London: Pluto Press.

Kavada, A. (2006). The alter-globalization movement and the Internet: A case study of communication networks and collective action. Paper presented at the Cortona Colloquium 2006. Retrieved October 22, 2010, from http://xdams.fondazionefeltrinelli.it/dm_0/FF/FeltrinelliCmsPortale/0072.pdf

Keck, M. E., & Sikkink, K. (1998). *Activists beyond borders: Advocacy networks in international politics.* Ithaca, NY: Cornell University Press.

Kelley, K. (2005). We are the Web. *Wired, 13*(8). Retrieved October 22, 2010, from http://www.wired.com/wired/archive/13.08/tech.html.

Kellner, D. (1999). Globalization from below? Toward a radical democratic technopolitics. *Angelaki: Journal of the Theoretical Humanities 4*(2), 101–113.

Klein, N. (2002). *No logo.* New York: Picador.

Krugman, P. (1991). *Geography and trade.* Cambridge, MA: MIT Press.

Langman, L. (2005). From virtual public spheres to global justice: A critical theory of internetworked social movements. *Sociological Theory, 23*(1), 42–74.

Letnes, B. (2002). Foreign direct investment and human rights: An ambiguous relationship. *Forum for Development Studies, 1,* 33–57.

Lianos, M., & Douglas, M. (2000). Dangerization and the end of deviance: The institutional environment. *British Journal of Criminology, 40,* 261–278.

Lipschutz, R. D. (2005). Networks of knowledge and practice: Global civil society and global communications. In W. de Jong, M. Shaw, & N. Stammers (Eds.), *Global activism, global media* (pp. 17–33). London: Pluto Press.

Lombreglia, R. (2005, July 31). The Internet of Things. *Boston Globe.* Retrieved October 22, 2010, from http://www.boston.com/news/globe/ideas/articles/2005/2007/2031/the_internet_of_things

Mason, P. (2007). *Live working or die fighting: How the working class went global.* London: Harvill Secker.

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

Moss, M. L., & Townsend, A. (2000). The Internet backbone and the American metropolis. *The Information Society Journal, 16*(1), 35–47.

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

O'Reilly, T. (2005). What is Web 2.0? Retrieved July 5, 2009, from http://oreilly.com/web2/archive/what-is-web-20.html

O'Reilly, T., & Battelle, J. (2009, October). *Web squared: Web 2.0 five years on.* Paper presented at the Web 2.0 Summit, San Francisco.

Olesen, T. (2005). Transnational publics: New spaces of social movement activism and the problem of

global long-sightedness. *Current Sociology, 53*(3), 419–440.

Overå, R. (2006). Networks, distance, and trust: Telecommunications development and changing trading practices in Ghana. *World Development, 34*(7), 1,301–1,315.

Pascal, A. (1987). The vanishing city. *Urban Studies, 24,* 597–603.

Phillips, D. J. (2003). Beyond privacy: Confronting locational surveillance in wireless communication. *Communication Law and Policy, 8*(1), 1–23.

Reinhardt, A. (2004). A machine-to-machine Internet of Things. Retrieved July 6, 2009, from http://www.businessweek.com/magazine/content/04_17/b3880607.htm

Richtel, M. (2009, June 17). I.B.M. to invest $100 million in cellphone research. *The New York Times.* Retrieved October 22, 2010, from http://bits.blogs.nytimes.com/2009/06/17/ibm-to-invest-100-million-in-cell-phone-research/

Routledge, P. (2000). Our resistance will be as transnational as capital: Convergence space and strategy in globalizing resistance. *GeoJournal, 52*(1), 25–33.

Routledge, P. (2003). Convergence space: Process geographies of grassroots globalization networks. *Transactions of the Institute of British Geographers, 28*(3), 333–349.

Shaw, D. (2001). The making of the twentieth-century world. In P. Daniels, M. Bradshaw, D. Shaw, & J. Sidaway (Eds.), *An introduction to human geography* (pp. 62–84). London: Pearson.

Thompson, M. (2007). ICT and development studies: Towards development 2.0. *Cambridge Judge Business School Working Paper Series, 27,* 1–17.

Thrift, N. (2004). Remembering the technological unconscious by foregrounding knowledges of position. *Environment and Planning D: Society and Space, 22*(1), 175–190.

Thrift, N., & French, S. (2002). The automatic production of space. *Transactions of the Institute of British Geographers, 27,* 309–335.

Townsend, A. M. (2001). Network cities and the global structure of the Internet. *American Behavioral Scientist, 44*(10), 1,697–1,716.

Tuters, M., & Varnelis, K. (2006). Beyond locative media: Giving shape to the Internet of Things. *Leonardo, 39*(4), 357–363.

Vogelstein, F. (2007, October 7). The Facebook revolution. *Los Angeles Times.* Available at: http://www.latimes.com/news/opinion/la-op-vogelstein7oct07,0,6385994.story

Want, P., Fishkin, K. P., Gujar, A., & Harrison, B. L. (1999, May). *Bridging physical and virtual worlds with electronic tags.* Paper presented at the Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: The CHI is the Limit, Pittsburgh.

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

Wasserman, E. (2009). Riding herd: RFID tracks livestock. Retrieved October 27, 2009, from www.rfidjournal.com/article/view/5272

Weber, S., & Bussell, J. (2005). Will information technology reshape the North-South asymmetry of power in the global political economy? *Studies in Comparative International Development, 40*(2), 62–84.

Welford, R. (2002). Editorial: Globalization, corporate social responsibility and human rights. *Corporate Social Responsibility and Environmental Management, 9*(1), 1–7.

Whitlock, W., & Micek, D. (2008). *Twitter revolution: How social media and mobile marketing is changing the way we do business & market online.* Las Vegas: Xeno Press.

Zook, M. (2003). Underground globalization: Mapping the space of flows of the Internet adult industry. *Environment and Planning A, 35*(7), 1,261–1,286.

Zook, M., Dodge, M., Aoyama, Y., & Townsend, A. (2004). New digital geographies: Information, communication, and place. In S. Brunn, S. Cutter,

& J. W. Harrington (Eds.), *Geography and technology* (pp. 155–178). Norwell, MA: Kluwer.

Zook, M., & Graham, M. (2007a). The creative reconstruction of the Internet: Google and the privatization of cyberspace and digiplace. *Geoforum, 38,* 1,322–1,343.

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

Zook, M., Graham, M., Shelton, T., & Gorman, S. (2010). Volunteered geographic information and crowdsourcing disaster relief: A case study of the Haitian earthquake. *World Medical and Health Policy, 2*(2), 7–33.

Research Article

Negotiating Openness Across Science, ICTs, and Participatory Development: Lessons from the AfricaAdapt Network

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Abstract

This article reflects critically on forms of openness and participation emerging from a collaborative network using information technologies for knowledge sharing on climate change and international development. It explores how multiple interpretations of these concepts coalesce around a particular initiative, shaping ways of working and understanding across different epistemic cultures (Knorr-Cetina, 1999) in the network. The resultant shared meanings and practices, it is argued, are a product of existent epistemic and participatory cultures, internal and external dynamics and economies of power, and emergent ways of working that are further shaped by engagement with particular information technologies and protocols. The process through which these shared meanings are constructed, however, is rarely transparent or openly reflected on, but rather, it emerges through the normalization of particular practices that "organize" our social relations. This limits our understanding of how a given "architecture of participation" has been constructed, or how it has situated those working in it. I consider the influence that these processes of meaning-making have had on the present shape of the network and reflect on what this means for such forms of collaboration more generally.

1.0 Introduction

The advent of new information and communication technologies, particularly of online, "Web 2.0" technologies that allow for a plurality of information sources and contributors from multiple devices, has stimulated the imagination of practitioners from a wide range of fields, including international development and the sciences. Through these new platforms lies the potential for groups once understood simply as *end users* or *consumers* of information to become active participants and producers, assuming multiple roles as they view, respond to, amend, and share content within and among different communities of interest or practice. This has led to claims that Web 2.0 represents a new "architecture of participation" that will democratize, and thereby challenge conventional paradigms of practice in ICT-mediated environments or relationships (Thompson, 2008, p. 825). Meanwhile, similar reflections on the evolving roles of "end users" have been unfolding in parallel in the areas of participatory development (Cornwall, 2006) and climate science (Berkes, Colding, & Folke, 2000), albeit to varying extents.

These transformations reflect broader challenges made to the notions of "official" or "valid" knowledge by critical, feminist, and postmodern theories (among others), as well as an increased awareness of the intimate

relationships between power, culture, and the construction of knowledge. They are also indicative of a broader critical rethinking of how particular epistemic communities and disciplines operate. With this context in mind, this article critically reflects on the prospect of a new architecture of participation emerging from a collaborative network using information technologies around climate change and international development. Using the case of a North–South network on knowledge sharing for climate change adaptation, it both explores how multiple interpretations of concepts such as "openness" and "participation" coalesce around a particular initiative, and explicates the processes that discursively construct the initiative's ways of working and understanding. The resultant shared meanings and practices, I argue, are a product of existent epistemic and participatory cultures, internal and external dynamics and economies of power, and emergent ways of working that are shaped by engagement with particular technologies and protocols. The process through which these shared meanings are constructed, however, is rarely transparent or openly reflected on, but rather, it emerges through the normalization of particular practices that "organize" our social relations (Smith, 2001). This limits our understanding of how a given "architecture of participation" has been constructed, or of how it has situated those working in it. It has profound implications within and beyond the boundaries of a particular initiative, as "knowledge cultures have real political, economic and social effects" (Knorr-Cetina, 2007, p. 370)—effects that can lead to the inclusion of some at the expense of others, and that fundamentally shape what can be achieved. Acknowledging this complexity and openly engaging with the "invisible" processes of negotiation and normalization of meaning offers a space to both expose the ways that power and culture construct and constrain our understandings of practice, and to challenge the ways that development is enacted.

This article begins by introducing the notion of epistemic cultures (Knorr-Cetina, 1999, 2007) within the contexts of climate science and international development and links it to the production of particular forms of discourse that are supported by mediating technologies, such as ICTs. I then describe how the intersection of these different communities in a collaborative initiative presents challenges to meaning-making through the case of AfricaAdapt, a North–South network for knowledge sharing on climate change adaptation in Africa. Through discussions with core partners hosting the network, I explore how ways of working were established and interpreted, and examine the influences that have contributed to particular discursive constructions of meaning and purpose within the network. Attention is given to the powerful influence of the development paradigm on how differently situated partners understand participation and openness, and on ways that the ICT-enabled environments within the network privilege certain forms of engagement at the expense of others. Based on these observations, I consider the influence that these processes of meaning-making have had on the present shape of the network and reflect on what this means for such forms of collaboration more generally.

2.0 Theoretical Background

2.1 Epistemic Cultures and the Discursive Construction of Meaning

Reflection on the processes and conditions through which knowledge is constructed, validated, and entered into currency has grown steadily since the 1970s. It has shed light on how power, gender, culture, and professional practice intervene in shaping what we "know," and how the power to define what is known both reinforces the authority of certain social groups and disempowers others. The rise of globalization and new technologies in post-industrial societies has also led to a growing emphasis on information and knowledge as political and economic currency in transnational "information" or "knowledge societies." Given these parallel trends in understanding around the situatedness of knowledge and its link to power, and the growth of knowledge as currency and commodity, researchers are keen to explore the makeup of what Knorr-Cetina calls *knowledge settings,* or "the whole sets of arrangements, processes and principles that serve knowledge and unfold with its articulation" (2007, pp. 361–362). These settings, she argues, are shaped by the particular epistemic cultures[1] that

1. Knorr-Cetina defines an epistemic culture as the "interiorised processes of knowledge creation. . . . [T]hose sets of practices, arrangements and mechanisms bound together by necessity, affinity and historical coincidence which, in a given area of professional expertise, make up how we know what we know" (2007, p. 363).

determine the policies and practices that sustain or discourage particular outcomes to inquiry (ibid.). Knowledge settings have historically tended to be bound by time, place, and "lifeworld" (laboratories within the physical sciences, for example), but the advent of networked social interaction on a global scale—largely facilitated by technological developments in ICTs—has permitted the rise of more distributed settings within which these processes unfold. This evolution invokes a merging of lifeworlds through the negotiation of compatibilities between different administrative and political cultures (ibid.). In a context such as climate change and development, where the field of inquiry overlaps multiple epistemic, geographical, and societal divides, a clearer understanding of how the products of these knowledge settings circulate, are adopted or subjugated by other communities or cultures with competing knowledge claims, and merge themselves with other "truths," is also required. It is within this contemporary state of the transnational, ICT-enabled *negotiation of,* and *trade in,* knowledge that the case discussed here finds itself.

As an approach to better understanding the link between the production of knowledge claims within particular epistemic communities and their entry into wider circulation I draw on the concept of *discourse.* A focus on the production of discourse is useful for understanding the ways communicative practices both constitute and express our social reality, and also reveal the role that power plays in this process (Foucault, 1980). "Power to control discourse," Fairclough argues, "is seen as the power to sustain particular discursive practices with particular ideological investments in dominance over other alternative (including oppositional) practices" (1995, p. 2). The discursive shaping of words (and the range of concepts to which they refer) is ultimately constitutive of objects and social relations, as well as of the subject positions within these discourses from which individuals or collectives can speak. Thus, the framing of the meanings of terms like *participation* and *openness*[2] in development effectively shapes the politics of development practice—and by extension, the potential agency and identity of those who are understood to be (or seek to be) operating within its community of practice. Cooke (2003), for example, argues that "participation," as it is put into practice in World Bank/IMF development programming, bears more in common with popular governance under late colonial administration than with the types of empowerment with which the term is frequently associated.

A final issue that will be touched on in this article is the role of new communication technologies in relation to this process of production, validation, and circulation of knowledge. Here, ICTs are understood to serve as "mediating technologies" that play a key role in how people organize and coordinate their (and others') actions. Silverstone describes the process of mediation as:

> a fundamentally dialectical notion which requires us to address the processes of communication as both institutionally and technologically driven and embedded. Mediation, as a result, requires us to understand how processes of communication change the social and cultural environments that support them as well as the relationships that participants, both individual and institutional, have to that environment and to each other. (2005, p. 189)

In this sense, the role of mediating technologies cannot be seen as passive or neutral, but rather, as simultaneous *products* and *producers* of the environments and contexts in which they are put to use. By understanding ICTs in this light, it is possible to draw useful comparisons and linkages between the impacts they produce and the impacts of other mediating forces in development, including managerial technologies (such as *the project* and *evaluation*) that "serve to organize and coordinate actions involving people, time, space and money in the interests of efficiency and accountability" (Kerr, 2008, p. 99). Research into the use of information systems and technologies in the context of development have yet to fully explore these issues of "power, politics, donor dependencies, institutional arrangements," yet these are "precisely the type of issues where critical work can open up the 'black box' as an aid to deeper understanding, and a stim-

2. Use of the term "openness" in this article draws on recent IDRC work that sees it as characterized by two concepts: egalitarianism and sharing. "Egalitarianism suggests an equal right to participate (access, use and collaborate). Sharing is embedded in the idea of enhanced access to things that were otherwise normally restricted" (Smith, Engler, Christian et al., 2008, p. 5).

ulus to appropriate action" (Walsham & Sahay, 2006).

2.2 Participation, Openness, and Knowledge in Climate Science

Given that natural sciences have traditionally been more strongly bound to a model of inquiry that privileges distance, objectivity, and authority than the development community, there has been less emphasis on inclusion, community voice, or openness to other knowledge sets within climate science until quite recently. Recent controversies around the transparency of the IPCC's climate modeling and prediction processes highlight the current bias toward closed "expert" dialogue in the establishment of new conclusions and knowledge (Tol, Pielke, & Von Storch, 2010). However, there is now an increasing acknowledgment of the potential for drawing on traditional practices bound within what are often deemed "nonscientific" knowledge sets (variously termed "local," "traditional ecological," or "indigenous" knowledge) to inform climate prediction, measurement, and adaptation, as well as an increase in support for engaging with communities in the *use* of climate information (Roncoli et al., 2002). This trend has emerged from a growing recognition of the limits of climate science in reliably predicting climate change and variability at the scale of resolution needed for communities to make informed decisions (Dessai, Hulme, Lempert, & Pielke, 2009), and of the central role that local knowledge, culture, and practice play in effective responses to climate change (Ensor & Berger, 2009).

As such, climate change represents a complex site where natural sciences, social sciences, culture, and politics intersect across multiple levels of action, from global climate models and governance frameworks down to local climatic impacts that stand to dramatically alter people's relationships with their natural environments. This site is further mediated through multiple technologies, including complex information technologies used for data collection, downscaling, and forecasting, as well as through global and regional institutional regimes in both the areas of climate change and development. These have profoundly shaped the contemporary discourse and body of knowledge around climate change and its link to development, and have also influenced the forms and levels of participation that are available, as I explore below more concretely.

3.0 AfricaAdapt: Negotiating Meaning Through Networked Collaboration

I now turn to the case of AfricaAdapt, a network that brings together partners from both the science and development communities, and that is based on a nongovernmental organization, an intergovernmental organization, a regional center for scientific research, and a development research institute. This provides a clear example of the types of intersections between differently situated epistemic communities, drawing on different forms of technological mediation, which exist within a network whose overarching objective of "promoting a culture of knowledge sharing" is closely aligned with promoting openness as it is defined above.

3.1 Methodology

This analysis draws primarily on semi-structured interviews conducted both face-to-face and virtually with five respondents from the network's implementing partners sitting at different levels of the network's management hierarchy, and with two respondents closely linked to the network's core partners. These included three of the network's Knowledge Sharing Officers (KSOs), who are charged with implementation of network activities and based in the partner African organizations; the then-program manager, based at the Institute of Development Studies; a member of the network management group based in an African partner organization; a UK-based knowledge-sharing advisor who was instrumental in the early development of the network's strategy and later provided mentorship to KSOs; and a representative from the donor institution familiar with the network's activities. Where possible, I have sought to use respondents' own words in describing their impressions of how these processes work, often placing their responses alongside one another to illustrate how people's situatedness has influenced their construction of meaning. These interviews were analyzed to draw out commonly recurring themes in the respondents' description of how meanings and ways of working were established within the partnership—themes that are explored below.

3.2 Background

AfricaAdapt is a knowledge-sharing network on climate change adaptation in Africa established in 2008 and hosted by four partner organizations:

Environment and Development in the Third World (ENDA-TM), based in Dakar, Senegal; the Forum for Agricultural Research in Africa (FARA) in Accra, Ghana; IGAD Climate Prediction and Applications Centre (ICPAC) in Nairobi, Kenya; and the Institute of Development Studies (IDS) in Brighton, UK. The network describes its aim as "facilitating the flow of climate change adaptation knowledge for sustainable livelihoods between researchers, policy makers, civil society organisations and communities who are vulnerable to climate variability and change across the continent" (AfricaAdapt, n.d.). It has since grown to a membership of nearly 900, comprised primarily of professionals and students from the African climate and development community. AfricaAdapt was funded through the UK Department for International Development (DfID) and Canada's International Development Research Centre (IDRC) under a broader program on Climate Change Adaptation in Africa (CCAA), which was designed to promote African participatory action research by African researchers. AfricaAdapt was therefore conceived to work within a similar ethos, offering a space for its members to profile the work they are doing, access information and findings from African research in a range of formats and languages, and establish new connections (both virtually and face-to-face) with others who are working on adaptation in Africa. The use of ICTs therefore plays an important role in facilitating and mediating relations between the four host partner institutions, as well as between the hosts and the broader AfricaAdapt membership. Among partners, key technologies that are used include Web 2.0 tools such as Skype, wikis, and Delicious, as well as more conventional tools such as e-mail. With its members, however, the network employs a different range of tools including Twitter, YouTube, and its own online platform that allows for the creation of user and project profiles in a style similar to that of Facebook and other networking sites.

Early thinking around the establishment of a knowledge-sharing network (before the selection of other partner institutions) was largely shaped by discussions between IDRC and IDS, including the establishment of what its understanding of what a culture of knowledge sharing actually involved. This was largely guided by one of the network's knowledge-sharing advisors, then based at IDS, who played an instrumental role in first developing its implementation strategy, and then sharing this with the selected partner institutes. It was on the basis of IDS' vision of knowledge sharing and the discussions held at the inception of the network that partners developed a professional profile of the future network drivers, its cohort of Knowledge Sharing Officers, to be based in each partner institution. Each partner institution then took these initial recommendations and tailored them to their particular contexts, and proceeded to hire their KSO. The wide-ranging profiles of the KSOs recruited is indicative of the process of internal interpretation and negotiation between the vision of knowledge sharing conveyed by IDS at the inceptive meeting and the established institutional culture within the partner organizations. Within the agricultural intergovernmental organization, a KSO with a background in library information systems and ICTs for Development was selected. Within the environmental NGO, a KSO with a background in marketing was chosen, while at IDS, it was a KSO with a background in education and development. Meanwhile, within the science-based climate research institute, it was decided that the KSO must be a climate scientist, and as a result, a meteorologist with a background in physics was selected.

The interplay between the promotion of a particular vision of a culture of knowledge sharing at the inception of the network, and the way this vision has been interpreted and ultimately translated into the actual recruitment of KSOs reveals the multiple institutional and epistemic influences that shaped how knowledge sharing has come to be understood and enacted within the network. This process unfolded in stages that were *visible* (through presentation of a concept at a meeting of partners), *partially visible* (through internal negotiations within partner institutes), and *largely invisible* (through the initial development of a vision of knowledge sharing to be presented for review and approval), and that involved similarly varying scales of participation. These processes can unfold with multiple levels and scales of participation and openness being enacted simultaneously, and can greatly influence how particular concepts are collectively understood, embodied, and enacted, particularly within decentralized collaborative networks.

3.3 Construction, Validation, and Contestation of Meaning in the Network

To illustrate the process through which meaning has been constructed within the network, it is useful to

begin with an examination of some of the core concepts underlying its principles and objectives, and to reflect on how differently situated partners understood these meanings and the process through which they were shaped. Three concepts that were noted by partners to be particularly central *and* challenging were the following: *a culture of knowledge sharing* (as discussed above), *researchers* (as one of the key targeted groups of the initiative), and *quality* (a particularly nebulous concept, but a much-debated one for a network aiming to attract, translate, and disseminate climate-related research). As stated at the outset of this article, the shaping of discourse is understood to be constitutive of objects, social relations, and the subject positions within these discourses from which individuals or collectives can speak. Thus, people's reflections on this process can be useful in revealing how power is negotiated among particular actors, institutions, or communities, and how this ultimately impacts who is included, and who is not. The two examples below aim to illustrate how these negotiations unfolded within the network.

"Our researchers are not lab coat researchers."

As stated earlier, researchers form a core constituency and target audience for participation in the AfricaAdapt network. In the development of the network's strategy, it was generally agreed that researchers should be the first target as part of a phased marketing of the network to its potential stakeholders. However, given the multidimensional nature of research into climate change in Africa, the range of possible researchers that might be targeted is wide and varied. Combined with challenges of translating the notion of "research" across cultural and linguistic divides among network members, this rather vague identification of a target audience created some initial confusion, according to a number of respondents. As one recounted:

> *KSO 1: One of my colleagues, a knowledge-sharing officer, she's from a francophone background, but she was always using the word researchers, researchers, and I think she reached the point where she was confused. So she was like "ok people, please clarify what do you mean by researchers? For me when I hear researchers I think of someone in a lab coat, but our researchers are not lab coat researchers."*

In time, however, the understanding of what is implied by researchers within the shared discourse of network members narrowed considerably, and it fell very much in line with the forms of participatory action research (PAR) that were being funded through the IDRC's CCAA program. This evolution was understandable on a number of levels, given that these forms of research matched well with the overall objectives of the network, and that there were clear advantages in terms of access to contacts and information for outreach, and of course, the potential advantage of being seen to be promoting donor-funded research. However, between members of the network, the process by and justifications for how "researchers" came to mean this particular set of actors are differently understood, though the influence of the funding partners was noted by all. One KSO, for example, felt that the network had gradually lost control of its focus due to increasing attention to donor priorities by group members, while for another KSO this arose from a search for focus from *within* the network, alongside the influence of donors:

> *KSO 2: I think that we said to ourselves, "let's start with researchers," but "researchers" is so broad . . . To reassure ourselves we fell back on CCAA projects because it was easier. We really focused on that and it helped us a lot. I think it was heavily influenced by the project funders. Even unconsciously we said to ourselves "Ah the CCAA projects!" because they funded us, but is that the best process?* [*trans.*]

In discussing this issue with the program manager, however, a very different perspective is offered; one that sees the network evolving (through some degree of contestation) *toward* greater inclusiveness, not away from it:

> *PM: I think a very important change that happened and something that I fought for, and actually something that the* [donor's] *field program manager in Africa was supportive of, and that was that AfricaAdapt didn't have to serve just the needs of the CCAA program, that it could actually be seen as covering the whole of the African adaptation domain, it didn't have to just be a client of the program. . . . I think for us it's allowed us to provide some degree of delinking from CCAA, but externally viewed people still think of it as some kind of child of IDRC.*

The range of perceptions on how the current understanding of targeted researchers evolved is indicative of how significant the "hidden transcript"

of partially or wholly invisible meaning-making can be in shaping differently situated people's understandings of how things work. They also point to the power of particular voices—both heard directly and inferred—in prompting an alignment of understandings (for example, of "researchers") with the messages they are understood to convey. Thus, while AfricaAdapt is theoretically open to anyone, and indeed those who discover it either online or at an event can be from a range of backgrounds, the extension of invitations to join this "open" space has been conducted in line with particular priorities, whether strategically or unconsciously.

Openness and participation are fluid concepts, and spaces for participation are contingent on a diversity of factors, including, in this case, the types of tools or resources made available for users to participate (climate data sets vs. Facebook-style profile pages, for example), the forms of invitation they receive to participate, the incentives for or pressures to accommodate particular actors over others (as alluded to above), and the types of values that a particular space seems to reflect and reinforce (as discussed below) (Cornwall, 2002). This is recognized by network partners, particularly in discussing the limited engagement of climate scientists as a part of the targeted researcher audience. The program manager provided some initial reflections on this point, suggesting that both internal and external factors have had an influence on climate scientists' limited participation in the network:

> *PM: Science has not played a particularly strong role, but again I think that's partly because there are other networks, and other spaces that inhabit the science interactions, and that we've tended to say we're not there to duplicate. . . . And I suppose we haven't really provided the kind of spaces and sharing spaces to really encourage a strong science dimension to the network.*

A KSO, however, focuses on the lost opportunity they associate with having failed to create the necessary incentives to bring climate scientists on board, particularly in light of the fact that one AfricaAdapt partner, ICPAC, is science-focused:

> *KSO 1: ICPAC has links to climate scientists and people like that but I don't see any of the scientists on board. So now that I think about it, yes, maybe it would have sort of, not diminished their role, but not made the most out of them. Because we are supposed to target researchers, we are only doing the* [*PAR*] *researchers, we are leaving out the climate scientists.*

These views reinforce the theory that the types of spaces made available for participation, as well as the spaces available elsewhere, have played a determining role on the types of participants that have ultimately joined the network. In effect, the decision to prioritize investing the network's finite human and financial resources into engagement with the action research community may have consequently constrained the ability of other types of researchers to engage, including climate scientists. While such decisions might be seen as a failure to be open and inclusive to all (as suggested by the KSO), on a more pragmatic level, they also reflect an understanding of the challenge (or futility) of being "everything to everyone," and instead developing a particular niche alongside other initiatives, as the program manager mentions. This illustrates a key challenge of promoting openness—namely, that the spaces for achieving it do not look the same for everyone, and therefore, they accommodate some more easily than others. It also highlights the degree to which the prioritization of a particular group of researchers, through processes that are influenced and interpreted differently by differently situated partners, have had a fundamental and lasting impact on the shape of the network. It also leads us to a related concept that may have influenced, and been influenced by, the membership to which the network ultimately appealed.

Assessing and Valuing "Quality"

It isn't surprising that, within a network dedicated to sharing knowledge on a subject as contentious and complex as climate change, questions of quality and validity of information are considered of utmost importance. Knowledge on climate change sits across a range of epistemic, disciplinary, and institutional communities, drawing on a range of sources of knowledge production that meet with varying levels of acceptance. In many ways, it is at this frontier between the supposed objectivity and verifiability of scientific observation, and the "softer" forms of local observation, traditional or indigenous knowledge, and multiple ways of representing knowledge that AfricaAdapt finds itself. Given that processes of gathering, appraising, and validating knowledge are central to the structure and practice of epistemic communities (Knorr-Cetina, 1999), it was clear from the network's inception that decisions would need to be made on the "editorial"

approach to quality control that would be pursued. These decisions would shape the opportunities for contribution among some audiences, while potentially creating a more *or* less familiar space for contribution for others, depending on the conceptions of quality and editorial control that were adopted. The thinking that framed these discussions is recounted by the program manager:

> *PM: Obviously from the very start we were critically aware of quality issues. But the fact that we wanted to be a reasonably open space, not heavily moderated, and one that appreciated different forms of knowledge, and IDRC pushed this too, they wanted a very strong community dimension to the website and to our action, and that we needed to make sure that we were engaging down to community level, indigenous knowledge and all that kind of thing. So kind of the editorial policy was always being really shaped from the start, to one that was reasonably open and freer than a lot of other editorial policies I've seen. Which obviously sat a little bit in tension with members of the managing group who said: "Well actually we need to be working on the basis of quality climate science, and quality science is the backbone to our work."*

Indeed, when asked about how AfricaAdapt should strive to sustain the quality of its knowledge resources, the KSO with a climate science background appealed for more stringent forms of expert moderation and control:

> *KSO 3: The knowledge that is generated and the quality of that knowledge has to be maybe supervised or maintained through some mechanism, one could be the sort of review mechanism put in place with experts or our own exchanges or what have you. . . . And also maybe when we put content up we have to be selective, maybe looking for people who are good in a specific specialisation, known scientists or known professors.*

These differences point to wider discussions on sources of knowledge within climate change and development, as noted at the outset of this article. The potential impact of this stance on the contributions that would be sought and accepted within the network were noted by the manager and the KSO cited above, particularly in terms of how users accustomed to far more prescribed notions of quality, especially climate scientists, might react. The program manager wondered,

> If a climate scientist within Africa who's writing, you know, what they think are high-quality papers on climate science, think well maybe you know 'I won't upload this to AfricaAdapt because there's no kind of validation process, so therefore you know, my work might be compromised.'

This suggests the possibility that taking an approach of seeking more inclusiveness may, in fact, *limit* the potential for participation from those working within epistemic cultures that privilege adherence to more standardized (or exclusive) measures of quality. It also represents a considerable challenge for initiatives seeking to promote sharing across disciplinary or epistemic boundaries, as archetypes of practice are rarely compared or discussed within this sharing, and yet are often poorly understood from one community to another.

Ultimately, the question of quality control has not yet led to serious conflict within the network's partnership, despite the fact that partners' own perceptions on this issue vary widely. We *do* see, however, a view of quality emerging in line with the particular stance on the broader debate over knowledge taken by both IDS and the donor organization. The implications of this stance are not insignificant, particularly within the political economy of knowledge production in the climate change adaptation community. The stance has also helped to shape the ways in which ICTs have been drawn on to enable users to contribute to knowledge sharing within the network, as I now explore.

3.4 Communication and Technologies in the Negotiation of Meaning

The decentralized nature of the AfricaAdapt network partners and its targeted audiences has meant that ICTs have played a very central role in both its management and the delivery of its services to members. However, the fact that connectivity and use of online technologies remain limited on the continent where 80% of network members are located presents a significant challenge to this role. This issue has been a point of reflection, as partners have sought to balance the selection and use of technologies that allow users to express themselves in a variety of formats (photos, video, blogs, etc.) while acknowledging the limiting factors of connectivity, literacy, access to technology, and more. There is also a need to recognize the "inscribed logic" of the tools that have been selected and their appropri-

ateness of fit with particular knowledge settings. The use of wikis as a space for co-creation, for example, where there is never a "definitive" version of a text, and where one's contributions are always subject to review and revisions by others, has met with unease among some members of the climate research community (IDS, 2009). Similarly, the absence of climate modelling tools and data sets within the range of tools (which are available on other knowledge platforms) reinforces a particular view of the forms and sources of information and knowledge that the network aims to put into greater circulation, as discussed above.

Beyond the selection and deployment of appropriate ICTs for network members, communication presents broader ongoing challenges to the core partners, who seek to ensure a spirit of openness and collaboration, while at the same time, negotiating different expectations within the bounds of each institution's norms of practice. These issues offer insight into the challenges of openness when collaborating across divides, be they institutional, epistemic, cultural, linguistic, or technological. They also overlap with the challenges of meaning-making raised in the previous section—both reinforcing particular meanings and being shaped by the meanings that have been produced. Core management partners, for example, pointed to an internal struggle of balancing a need for greater openness between partners with the desire to create spaces that allow for safer risk taking, particularly among KSOs, a stance that was strongly advocated by the IDS knowledge-sharing advisor. He explains:

> *I think at an early stage we felt this was the KSOs and the knowledge sharing advisors coming together, talking about where would be a space that the KSOs could themselves share, and build up their sense of peer support, and the decision to have a wiki space for the KSOs, which was a private space, seemed like a very good idea. . . .* [*A*]*nd there was actually a desire from the core group to know actively about what the KSOs were talking about in their meetings, and there was a bit of negotiation there about how much would be shared.*

These negotiations in promoting openness within the partnership while avoiding the forms of compulsory visibility, or "information panopticism" (Zuboff, 1988), point to an important link between openness and the technologies that support it. A closed online space for KSOs outside of managerial oversight was dissonant with the institutional hierarchies and practices within some partners, as well as with some partners' visions of open sharing, whereas the creation of "safe spaces" within the model of openness espoused by others was seen as essential.

Beyond ICTs: Mediating Technologies and the Regulation of Practice

Beyond the mediation that ICTs provide, other technologies (using the term in its broader sense) have fundamentally shaped the forms of openness and participation that have emerged from within the network. Of particularly strong influence here is the concept of "the project" itself, along with its associated techniques and practices. This is particularly pertinent to the field of international development, where action is largely shaped around relationships that are framed by the project structure. As mentioned at the outset of this article, the partially visible process of developing the initial project proposal established the discourse through which understandings of the network's aims and definitions were later formalized. Further, the development of partner work plans and logical frameworks has served to delineate the spaces where partners and particular individuals within partner organizations are expected to take a leading role, essentially delineating and rendering visible spaces and degrees of openness within the activities of the partnership. One KSO highlighted the potential of these technologies for making visible the activities in which partners are engaged, arguing that "we should work more on putting communications systems into place that are really crosscutting, and project management tools such as worksheets; very simple tools so that any project member can see what's going on." Another KSO highlighted the importance of these technologies in the governance of partners' actions:

> *KSO 3: So there is the governance structure of AfricaAdapt and on top of that we have the project documents which serve as the guidance to execute the project. So those are the things which lead us to decisions. For example, where decisions are made by the core group members for example, based on the project document and then actions are taken by say if a KSO has to do it or if each individual institution has to do it.*

Thus, the development and use of these forms of project documentation effectively serve to mediate

and organize people's actions in line with prescribed norms, both within and among partner institutions (Kerr, 2008; Smith 2001), helping to clarify roles and responsibilities—but at the same time, potentially imposing boundaries on actors' agency. The statement above also points to the hierarchy of engagement perceived by the KSO (flowing from a project document [as developed and ratified by a limited set of actors] to a core management group, down to KSOs who execute particular decisions), a scale that is differently acknowledged and adhered to within each partner institution.

In AfricaAdapt, as in most other projects, mediating technologies, including ICTs and broader forms of managerial technology, serve to facilitate certain forms of interaction and communication, while precluding others. In the context of developing new insights on openness and participation, unpacking these dynamics can reveal the complexity of attributing the impacts of particular technologies while partners are enmeshed in multiple layers of mediation. For example, the use of new communication tools, such as the KSO wiki mentioned above, may create new spaces for co-construction of meaning, but these benefits may be offset or challenged by forms of institutional hierarchy and limits implied through other managerial technologies, such as the project's logical framework. The concluding section of this article draws out some of these observations and considers what they might mean for future research and action.

4.0 Discussion and Conclusions

AfricaAdapt has set itself an ambitious challenge of encouraging greater openness and collaboration in knowledge sharing on climate change adaptation across a multitude of divides, and in doing so, it has achieved some remarkable successes, all while revealing important lessons. This article has reflected on these by drawing directly on the viewpoints and experiences of those situated at different positions within the network's core partnership. In particular, it has considered the ways that the negotiation of meaning within partnerships influences the scope for a "new architecture of participation," and the ways that ICTs and other mediating technologies influence (and reflect) this negotiation. An overarching conclusion supported by this study is that, while these new technologies may, indeed, offer new avenues for contribution and participation in certain contexts, they are subject to a number of other factors that may help to determine whether and in what form this new architecture will emerge. Further, given the varying interpretations of openness and participation, particularly in collaboration across epistemic communities (as we tend to find in climate change and development), consensus views on the suitability of a given architecture may be difficult to establish. Beyond these more general observations, the network's experience highlights the following key points of learning:

- *Conceptions of openness and participation are products of particular epistemic and institutional cultures, and they will "democratize" knowledge production differently.*

Recalling Knorr-Cetina's assertion that "knowledge cultures have real political, economic and social effects" (2007, p. 370), interpretations of what is implied by "collaborative" rather than "centralised" production of content (Smith, Engler, Christian et al., 2008), for example, are fundamentally shaped by the existing institutional and epistemic traditions onto which these concepts are overlaid. These can, in turn, have a determining influence on when and whether one person's opinion can override another's, as well as on whether opportunities for collaboration must be invited or claimed, etc. The influence of these existing knowledge cultures cannot be discounted, and must be better understood within the broader context of a political economy of knowledge generation, validation, and circulation in order to be engaged with effectively. Within networked collaborative environments such as AfricaAdapt, this task becomes even more complex, as these different conceptions of openness intersect, and therefore must be negotiated.

Further, in contexts where the promotion and circulation of knowledge from outside of dominant practice is a stated aim, the bias toward aligning spaces and technologies with subjugated knowledge and representations may necessarily entail a *limiting* of participation and openness to others, as was evidenced in the discussions on quality, for example. Thus, the promotion of openness within networks may involve difficult decisions about whose ways of knowing, working, etc., will be modeled at the expense of others—discussions that seldom occur openly. Consequently, it should be acknowledged

that the creation of spaces for participation (such as platforms and networks) cannot occur "outside" of the broader dynamics of power and authority of a given setting or epistemic community. This suggests a more complex relationship between openness and the democratization of knowledge than was assumed by network partners at the outset of the AfricaAdapt program, for example, and calls on knowledge intermediaries to reflect more closely on the roles they (and others) play in opening or limiting these spaces, and to whom.

- *Formal and informal negotiation of meaning is central to the shared understanding that is ultimately produced in networked collaboration.*

Building on the previous point, collaboration across divides invariably entails a negotiation of meaning among asymmetrical and differently situated partners. These negotiations can take place in contexts that may be informal or "invisible," formal and open, or formal and closed. Meaning often emerges from a combination of these contexts, leading to a lack of clarity on how particular understandings came into use. Actors are not equally placed to influence the outcomes of such negotiations, and understanding how people's positioning (as donors, Northern partners, junior or senior staff, etc.) affects their access to and influence on these outcomes is central to understanding how meaning has been constructed within the partnership. Beyond this, the study has noted how, frequently, meanings that appear to be shared may be institutionalized or enacted in vastly different ways (as was the case with the hiring of KSOs), and thus may lead to very different outcomes.

- *ICTs and other mediating technologies play an influential role, both in the negotiation of meaning, and in determining how we move from meaning to action.*

Finally, it is important to recognize the role that mediating technologies play in facilitating or precluding certain forms of communication and participation. There is a need to recognize the challenge of balancing an intensification of technologies and visibility with the assurance of spaces in which people can struggle to create meaning for themselves before engaging openly. It is also important to bear in mind that particular mediating technologies can either reinforce or clash with the norms of participation established within particular epistemic and cultural norms, and to understand the impacts that this will ultimately have on inclusion.

This article has also situated ICTs as one group out of a variety of potential mediating technologies (such as the notion of the project itself in the context of development) that can mutually reinforce or contradict one another. Thus, I argue, we cannot look to ICTs as guarantors or models of new architectures of development without also looking at the whole range of practices, understandings, and mediations that unfold within this complex arena (Avgerou, Ciborra, & Land, 2004). Doing so, however, offers us new opportunities to not only strive for better openness through the use of new communication technologies, but to challenge the very ways that development partnerships are enacted.

Moving Forward

At the core of addressing the concerns raised here is acknowledging the inevitability (and normalcy) of these processes of meaning negotiation within collective partnerships from their outset, and considering the forms of visibility and openness that these types of negotiation involve. This might mean spending significantly more time at the earliest stages of collaboration unpacking assumptions that may (from one individual's or institution's perspective) appear obvious and uncontroversial, but which could seem highly contentious to others. It may demand identifying and mapping key influences on discursive production and meaning-making, and reflecting on how differently situated partners are linked to these influences. This point was echoed by the AfricaAdapt program manager in his reflections on how he might have approached the initial phases of network development differently:

> *PM: I would, we've talked about this a number of times, would have worked harder at the start in engaging the whole institution in a discussion about what knowledge sharing means for them, from the start, rather than thinking that we can build the capacity of a few individuals, and then begin to think that that's going to change the institutional culture.*

This suggests, I would argue, the need for placing reflexivity and collective learning at the center of efforts to achieve openness, and for appreciating the risks people take in confronting and revising their own practices and understandings, particularly across epistemic divides. This learning could also

draw in a review of the evolving appropriateness of the technologies being deployed within an initiative to assess their appropriateness. This form of learning, seen as central to communities of practice (Wenger, 1998), is too often overlooked within networked development practice, or is addressed post hoc, rather than as a starting point. As such, openness is perhaps best understood as a collective process that is continuously under development and review, rather than as a fixed endpoint that can be constructed. ■

References

AfricaAdapt (n.d.). *About us.* Retrieved May 27, 2010, from http://www.africa-adapt.net/AA/AboutUs.html

Avgerou, C., Ciborra, C., & Land, F. (2004). *The social study of information and communication technology: Innovation, actors, and contexts.* Oxford: Oxford University Press.

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of traditional ecological knowledge as adaptive management. *Ecological Applications, 10*(5), 1,251–1,262.

Cooke, B. (2003). A new continuity with colonial administration: Participation in development management. *Third World Quarterly 24*(1), 47–61.

Cornwall, A. (2002). *Making spaces, changing places: Situating participation in development.* Brighton, UK: Institute of Development Studies.

Cornwall, A. (2006). Historical perspectives on participation in development. *Commonwealth & Comparative Politics, 44*(1), 62–83.

Ensor, J., & Berger, R. (2009). Community-based adaptation and culture in theory and practice. In W. N. Adger, I. Lorenzoni, & K. O'Brien (Eds.), *Adapting to climate change: Thresholds, values, governance.* Cambridge: Cambridge University Press.

Dessai, S., Hulme, M., Lempert, R., & Pielke Jr., R. (2009). Climate prediction: A limit to adaptation? In W. N. Adger, I. Lorenzoni, & K. O'Brien (Eds.), *Adapting to climate change: Thresholds, values, governance.* Cambridge: Cambridge University Press.

Fairclough, N. (1995). *Critical discourse analysis: Papers in the critical study of language.* London: Longman.

Foucault, M. (1980). *Power/knowledge: Selected interviews and other writings, 1972–1977.* New York: Pantheon.

IDS. (2009). *IDS submission to the Nairobi Work Programme synthesis report* (Draft).

Kerr, R. (2008). International development and the new public management: Projects and logframes as discursive technologies of governance. In S. Dar & B. Cooke (Eds.), *The new development management.* London: Zed Books.

Knorr-Cetina, K. (1999). *Epistemic cultures.* Cambridge, MA: Harvard University Press.

Knorr-Cetina, K. (2007). Culture in global knowledge societies: Knowledge cultures and epistemic cultures. *Interdisciplinary Science Reviews, 32*(4), 361–375.

Roncoli, C., Ingram, K., & Kirshen, P. (2002). Reading the rains: Local knowledge and rainfall forecasting in Burkina Faso. *Society and Natural Resources, 15,* 409–427.

Silverstone, R. (2005). The sociology of mediation and communication. In C. Calhoun, C. Rojek, & B. Turner (Eds.), *The SAGE handbook of sociology.* London: SAGE Publications.

Smith, D. (2001). Texts and the ontology of organizations and institutions. *Studies in Cultures, Organizations and Societies, 7*(2), 159–198.

Smith, M., Engler, N. J., Christian, G., Diga, K., Rashid, A., & Flynn-Dapaah, K. (2008). Open ICT4D. Ottawa: IDRC.

Thompson, M. (2008). ICT and development studies: Towards development 2.0. *Journal of International Development, 20,* 821–835.

Tol, R., Pielke, R., & Von Storch, H. (2010, January 25). Save the panel on climate change! *Spiegel Online.* Retrieved May 21, 2010, from http://www.spiegel.de/international/world/0,1518,673944,00.html

Walsham, G., & Sahay, S. (2006). Research on information systems in developing countries: Current

landscape and future prospects. *Information Technology for Development 12*(1), 7–24.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity.* Cambridge: Cambridge University Press.

Zuboff, S. (1988). *In the age of the smart machine: The future of work and power.* New York: Basic Books.

Research Article

Enacting Openness in ICT4D Research

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Abstract

This article explores the role of ICT4D research in producing "actionable knowledge" (Hearn & Foth, 2005) for development. We consider how a frame of openness (Smith & Elder, 2010), interpreted here as an active process of engagement, knowledge sharing, and co-creation, might guide ICT4D research. Our analysis is directed at both the project and institutional levels, focusing particularly on universities in the Global South.

The case of iDART, a pharmacy system for antiretroviral drug dispensing in remote and underresourced public health clinics in South Africa, is interrogated as an example of an open approach. As of early 2010, iDART managed antiretroviral drug dispensing for approximately 150,000 patients in South Africa, and the research group that initially developed it had spun out into a separate nonprofit.

In iDART and related projects, we have tried to enact a shift toward openness in both the technologies we work with and the system development process. We have also engaged with the research process itself, trying to establish a developmental understanding of our work as ICT4D researchers, as well as with the university as an institutional structure. The results demonstrate barriers on both practical and institutional levels, but also encouraging successes. The success of iDART as a model for knowledge production is well framed by an open approach to ICT4D research.

In the 2003 operational plan for HIV/AIDS, the South African government clarified that antiretroviral treatment (ART) increased the life expectancy of people living with AIDS. This statement, which today is uncontested, ended a decade of bruising conflict over the state's obligation to provide treatment for people living with HIV/AIDS. Thousands had died as politicians dragged their heels, and when the government proved intractable, the battle moved to the courts.

Following a series of successful legal challenges and the development of the operational plan, attention turned to the practical complexity of managing the supply of medication to the most rural areas (Wood et al., 2008). With the full ART rollout, the Department of Health (DOH) set the ambitious target of treating 80% of all people requiring ARVs (antiretroviral drugs) by 2011 (DOH, 2007). Effective and sustainable treatment with ARVs requires an adherence rate of 95% to prevent the development of drug resistance in individual patients, as well as possible mutation of the virus. Additionally, the treatment requires a complex time-and-diet regime, and side effects need to be monitored regularly (Bekker et al., 2003). For under-resourced primary health care centers in disadvantaged areas, HIV/AIDS treatment, and particularly the requirement to monitor patients regularly, seemed a nearly impossible task.

ENACTING OPENNESS IN ICT4D RESEARCH

iDART—intelligent Dispensing of Antiretroviral Treatment—is an electronic pharmacy system designed to increase the capacity of remote and under-resourced clinics providing ART. iDART began in 2003 as part of a research collaboration called Cell-Life. From 2001 to 2006, Cell-Life existed within the University of Cape Town and the Cape Peninsula University of Technology (CPUT). Intentionally diverse, the collaboration included students and faculty from engineering, the health sciences, and computer science. In 2006, Cell-Life became a nonprofit organization and was spun out of the University of Cape Town. This coincided with a shift in focus from primarily being a research organization to including a mix of research and implementation support, prompted partly by the growing number of sites using the software and requiring such support. As of mid 2010, there are over 20 host organizations (NGOs or funders) managing 67 iDART sites, covering all nine provinces of South Africa. Approximately 150,000 patients receive their medication through iDART each month. This represents nearly one-sixth of all patients on state- or donor-sponsored ART.

As a research group, Cell-Life originated as a response to a critical development problem—the HIV pandemic—that was unprecedented in both scale and structure. HIV disproportionately affects the rural areas of South Africa, where services are least developed. The public health system, emerging from decades of Apartheid neglect, was already overburdened. An ART rollout of the scale required had never been tried in a developed country, let alone in the developing world. The novelty of the problem mobilized the research community. There was also a very real sense of urgency—people were dying, and the imperative of "actionable knowledge" was keenly felt.

Seven years later, iDART has made the transition from research project to large-scale implementation, with sustained partnerships with a large number and wide variety of host organizations and funders.

In this article, we reflect on the process of developing and implementing iDART as a model for ICT4D research projects that address a national development imperative. Our analysis is grounded in experience, is reflective, and is part of our ongoing learning. Both authors have been directly involved, in various capacities, in iDART and Cell-Life.

The starting point for the discussion is the concept of Open Development, proposed by Smith and Elder (2010), as a way of organizing social activities for development benefits that favors:

- universal over restricted access to communication tools and information;
- universal over restricted participation in informal and formal groups/institutions;
- collaborative over centralized production of cultural, economic, or other content.

Translated into the landscape of university-based academic research, we understand openness as a way of doing research that actively promotes:

- universal over restricted access to research products;
- universal over restricted participation in the research process;
- collaborative over centralized production of knowledge, and recognition of diversity in knowledge systems.

Many theoretical ingredients for a research concept based on openness are already available. Higher education, development studies, and information systems design have all engaged with the issue of participation, whether from a pragmatic standpoint (arguing that involving more stakeholders achieves better outcomes), or from an ideological one. The open access movement promotes universal access to research products, as do research initiatives with an ideological commitment to open source software. There is also an established critique of the monolithic and exclusionary nature of traditional academic knowledge production, which methodological approaches, such as action research, explicitly confront.

The analytical framework for this article organizes observations on openness, both from the literature and the discussion of the iDART case, into three areas. This framework reflects our roles in the project, as well as the natural disciplinary divisions embodied in the literature. It also embodies a sense of combined (sometimes conflicting) roles common among both researchers and practitioners of ICT4D:

- openness in system design and implementation;
- openness in ICT4D research;
- openness and the developmental role of universities in the Global South.

The following section uses this framework to present the theory that informs our understanding of openness in ICT4D research. Table 1, placed at the end of the theory section, maps out theoretical concepts, both in relation to our analytical framework, and to Smith and Elder's three dimensions of openness.

Theoretical Ingredients for an Open Approach to ICT4D Research

Openness in System Design and Implementation

Research in ICT4D has a normative orientation, seeking to influence policy or practice in the ultimate service of development goals. iDART, implemented in the public health sector at the local (primary care) level, arose amidst an academic discourse of overwhelming optimism about the potential of e-government for development (Heeks & Bailur, 2007). The problematic nature of this soon became clear, and by 2003, it was reported that most government information systems projects in the developing world had ended in either partial or total failure (Heeks, 2003).

There is a vast body of work in information systems (IS) dealing with IS project failure, including many examples from the developing world. For reviews of this literature, see Dada (2006), Pardo and Scholl (2002), and Heeks (2002). We know that systems have failed because their implementers have tried to force an unwanted or contentious change in organizational processes. Another reported reason has been that the required technology, such as hardware and connectivity, did not exist or was not maintainable due to limited human, technical, and financial resources. In general, the literature on information systems failure suggests that failure occurs because some aspect of the system context—social, technical, or political—is inadequately understood. In developing countries, the potential for "design-reality gaps" (Heeks, 2002) is particularly acute.

In addition to factors operating at project level, the stubborn persistence of information systems failure suggests a broader systemic problem. The structure and realization of the ICT "ecosystem"—from technologies, implementation, and development processes to ICT research and teaching—do not appear to promote success in ICT4D projects. Crucial gaps exist between technology and context, design and reality, and project planning and development (expensive, high-intensity, single-location work amenable to project-based funding approaches), and ongoing support and implementation (low-budget, dispersed, and far harder to control and fund).

If technology is understood broadly, the problem described is a familiar one in studies of failed development projects. Pragmatic prescriptions emphasize tools for project planning, often as a way to highlight potential problem areas. Other tools and methods provide a simplified way to communicate technical and project management concepts to a mixed audience. From the perspective of openness, this last point is crucial. System design methodologies premised on improving communication between technical and nontechnical stakeholder groups, such as ETHICS (Mumford & Weir, 1976) and Soft Systems (Checkland & Scholes, 1989), as well as Blake and Tucker's Socially Aware Software Engineering (2006), are potential ingredients for an openness-based approach to system design and development in ICT4D projects. Most mainstream work has emphasized the technical utility of user participation in IS, but there are also authors (including Mumford, as well as Hirschheim & Klein, 1994; Byrne & Sahay, 2007; and Blake & Tucker, 2006) who take the more radical view of participation as a condition of worker ownership of the tools of work.

The issue of participation has also been addressed in development studies, from Chambers (1995), through virtual ubiquity in mainstream development discourse, to a backlash against the "tyranny" of participation (Cooke & Kothari, 2001). In information systems projects, Heeks' (1999) cautionary article is emphatic about the difficulties of achieving equitable and effective participation. The important point here is that, despite differing views on its purpose, and acknowledging the practical challenges it poses, the idea of participation enjoys broad support in both IS and development studies. Like broad-based communication, participation seems a natural goal for an approach to system design based on openness.

Openness in ICT4D Research

Research approaches privileging participation have also emerged, particularly those connected to the ideas of socially responsive research and "democratizing knowledge" (Vaillancourt, 2005). Action

research, which is carried out through continuous engagement with the study community and encourages redefining research objectives based on their self-definition of needs (Rabinovitch, 2004), is clearly aligned with participation. Here, too, there are both pragmatic and ideological justifications for increasing participation. Crewe and Young (2002) take a pragmatic stance, arguing that wider participation may increase the relevance of research to policy by helping to build "legitimacy chains" to informants. For Reason and Bradbury (2007), on the other hand, action research is:

> a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview which we believe is emerging at this historical moment . . . in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities.

This definition recognizes action research as an expression of a specific worldview. It also makes explicit the normative orientation of action research work, where the primary goal of the research is to effect goal-oriented change. Against positivist claims of an objective reality that exists apart from the research process, action research aims to influence the shifting, subjective "reality" that is uncovered. Participation is a driver of change, but it is also a democratic means of allowing the frame of the people who will be directly affected to determine the kind of change that is desirable. This observation links to openness as favoring universal over restricted participation in the research process—including defining research priorities.

This shift away from the positivist paradigm of traditional scientific knowledge production is inherently political. Action research, in its rejection of monolithic knowledge claims, also rejects the objectivity claim of technical expertise. The "legitimating discourse" (Rojo van Dijk, in Thompson, 2004) of interventions based on a supposedly neutral technical goal (Wilson, 1997) is similarly denied. In its place, Wilson (2007) imagines a continuous striving toward Habermas' "ideal speech situation," with "genuine dialogue between actors, where different knowledges are valued as a source of creative learning and hence new knowledge." The primary goal of the researcher becomes progressive attainment of the ideal speech situation, which, in itself, is already the ideal of collaborative production of knowledge.

Despite arising from a very different literature, the concept of communities of practice (Soeftestad, 2001) provides a lever to understand collaborative production of knowledge in practical terms. In both production and dissemination, the researcher is understood as embedded within a wide community of information systems stakeholders (Blake & Tucker, 2006; Byrne & Sahay, 2007), with the ultimate aim of the research process being to develop "actionable knowledge" (Hearn & Foth, 2005) for a diverse group. Communities of practice, which develop over time based on shared experience and aligned goals, may describe a mechanism for producing "actionable knowledge" outside of any formal research agenda, and beyond the timeline of single research projects.

Openness and the Development of Universities in the Global South

For Brett (2009), development is best analyzed—and interventions best operationalized—at the institutional, rather than the individual, level. For ICT4D research, this means interrogating the research process not just in individual projects, but also in terms of the role of the university in national development. Brett's "liberal institutional pluralism" holds the following: [O]pen, pluralistic and science-based institutions are difficult to create . . . [L]iberal models are crucial to all attempts at social and political emancipation, but institutionalizing them is not just a technical problem but generates practical challenges that demand a credible theory of political agency and practice that has to operate at both macro- and micro-levels. (ibid., p. 306). An open approach to ICT4D research, backed by the theoretical ingredients cited in this paper, represents one imagining of a liberal model.

Speaking to knowledge production, Brett acknowledges the research-policy-practice gap among development theorists, who "fail to ask who might be willing to implement their recommendations" in a nebulous and ill-defined community of "practitioners" (ibid., p. 21). An open system of knowledge should be structured such that theorists are encouraged to confront issues of agency and power in the implementer community. Pluralism works only when it is engaged with local knowledge

Table 1. Theoretical Concepts Summary.

	System design and implementation	**ICT4D research**	**Openness and development in Global South universities**
Universal over restricted access to research products	Open source software development	Research-policy-practice links, communities of practice, "actionable knowledge"	"Mode 2" knowledge production, alternatives to traditional publication models
Universal over restricted participation in the research process	Sociotechnical systems design methodologies	Action research, stakeholder engagement, researcher as facilitator	Recognition of Gramscian "organic intellectuals" in knowledge production and dissemination
Collaborative over centralized production of knowledge, and recognition of diversity in knowledge systems	Emancipatory and neo-humanist approaches—ETHICS, soft systems, social shaping	Ideal of knowledge production as a Habermasian "ideal speech situation"	Institutions and development in late-developing countries

systems, and with the crucial knowledge networks of "organic intellectuals"—a Gramscian concept understood by Brett as "teachers, priests, traditional leaders and local activists" (ibid., p. 306).

The starting point of a liberal and pluralistic understanding of the institutional nature of universities in the Global South has to be that knowledge is developed and used—and should be understood—within a particular context. Speaking to applied fields generally, Gibbons et al. (1994) acknowledge context in their concept of "Mode 2" knowledge production—"socially distributed, application-oriented, trans-disciplinary, and subject to multiple accountabilities." Unlike in information systems design or the planning of development interventions, the assumption here is not simply that context should be taken into account as part of the design process. The context of knowledge production, embodied in the structure of institutions and the groups that participate, shapes the knowledge that is produced.

Incentive structures and exclusion are as important as the way knowledge is communicated and disseminated. As Nowotny et al. (2003) recognize in a follow-up article on the "Mode 2" thesis, the reciprocity of "science speaking to society" and "society speaking back to science" is irrevocably marked by exclusion. In familiar dependency terms, Chambers (1999) laments the existence of "cores and peripheries of knowledge," with devastating "centripetal force[s]" that shape knowledge production according to the priorities of the core. Diversity in knowledge production cannot be achieved without confronting the embeddedness of universities in the Global South within global networks of wealth and power.

A parallel body of work in science and technology studies is concerned with the social shaping of technology artifacts. The social shaping movement is concerned with the context and process of technology development, and with exposing the power structures it reflects and reinforces. Williams and Edge describe social shaping in terms of "choices":

> Central to SST is the concept that there are "choices" (though not necessarily conscious choices) inherent in both the design of individual artefacts and systems, and in the direction or *trajectory* of innovation programmes. If technology does not emerge from the unfolding of a predetermined logic or a single determinant, then innovation is a "garden of forking paths". Different routes are available, potentially leading to different technological outcomes. Significantly, these choices could have differing implications for society and for particular social groups. (1996, p. 866)

According to social shaping theory, an open system of innovation that enables effective primary control of technology by marginalized groups would result in better outcomes for these groups. This is likely unattainable, however, and even if it were, technology development never takes place in isolation. Kallinikos (2004) observes that human inventions "solidify over time" as they become socially embedded, and remain malleable along fewer and

fewer dimensions as they increasingly impose their own logic. The choices we have now are determined by those who walked the path before us, and by the long history of technology as a tool in the exercise of political and economic power. A pragmatic response, particularly in the context of widespread information systems failure, is to understand the extent to which openness as a liberal model for research and teaching can be realized in universities in the Global South.

Case Study: iDART, A Pharmacy System for Antiretroviral Dispensing

Cell-Life, a group comprising researchers, students, and medical personnel from the University of Cape Town and the Cape Peninsula University of Technology (CPUT), was created in 2001 to investigate IT systems for HIV management in the public health sector. Together with one of the first groups providing ART to people in the townships of Cape Town, the Desmond Tutu HIV Centre (DTHC), a number of tools were developed to support treatment. Once a large-scale ART rollout began to look likely, DTHC increasingly focused on providing treatment at clinical research sites. This necessitated the development of a basic infrastructure for tracking drug packages through the supply chain, from initial stock arrival to the creation of monthly supply packets, and on through patient collection at remote clinics.

System Description

Together with the DTHC, Cell-Life conceptualized the details of a basic dispensing system for antiretroviral drugs in public primary care centers. The system's core focus was to support pharmacists in dispensing drugs accurately to large numbers of patients by allowing printing of labels and a simple stock control. Barcode scanning was used to reduce dispensing time. The system was written in Java, using open source components to keep it both free of licensing costs and portable across the different operating systems used at primary health facilities.

iDART was designed with the following constraints in mind (after Rivett & Tapson, 2009):

1. The software had to support the core functions of dispensing to HIV-positive patients, but was not initially a full-fledged stock management system.
2. The on-site software setup needed to be implemented within one day, and the available time for staff training was no more than seven hours. Training was nearly always conducted "on the job" while dispensing to patients.
3. The software needed to be self-explanatory to the extent that new staff could be trained by the existing staff using the software. This was a particularly important point due to the high staff turnover in rural centers. A manual of over 100 pages was produced but never read; two-page "quick guides" were routinely found stuck to pharmacy computers.
4. The software needed to run without Internet connectivity, but still back up the dispensing database to an external server. This was accomplished with a GSM modem that connected directly to the cell phone network.
5. The software had to be flexible enough to allow for different dispensing models, depending on the setup of each clinic. Models included simple on-site dispensing (one month's supply of drugs), multimonth dispensing for patients with good adherence levels, and down-referral dispensing, in which packages made at a central pharmacy would be collected by patients later, from a nurse at a local clinic.

Since pharmacy management and dispensing are fundamentally process-based and numeric, it is relatively easy to transfer these particular aspects into an ICT system. On the other hand, the realities of public health care in resource-constrained settings can make the implementation of systems very difficult (Brown et al., 2006). For this reason, iDART evolved to support a small number of basic tasks, including routine dispensing and capture of basic patient and prescription data. This strong focus on the client and the beneficiary—the public health pharmacist and the HIV-positive person—resulted in a system with functionality that was very different from those of the commercial alternatives.

Implementation Sites

The initial iDART prototype was developed in 2004 for a pilot site of DTHC, the Gugulethu Community Clinic in a township near Cape Town. During 2005, iDART was re-written for use by the DTHC research pharmacy, which was dispensing to small numbers

of patients in the greater Cape Town area. During the period of 2003–2008, research institutions had started to offer support to government clinics at the local level—initially in defiance of the national government, which indicated that a "plan" had to be developed for a national rollout. Capacity was so constrained at the local level that sustainable treatment was not possible without the help, advice, and resources of academics in the health sector. Even so, by 2005, only 14.9% of South Africa's registered pharmacists were working in the public sector (Health Systems Trust, 2005), and pharmacy services proved to be a major barrier to the rollout.

This atmosphere of social activism, coupled with the notion of having to prove to government that it was possible to provide treatment even in resource-constrained rural areas, was one of the unforeseen enablers of iDART. Since iDART collaborated with DTHC, other research institutions, such as the Medical Research Council of South Africa (MRC), the Reproductive Health Research Unit (RHRU), and the Paediatric Health Research Unit (PHRU) at the University of the Witwatersrand, were aware of the system and its early success. Through this network, contacts were established in rural areas where the various academic institutions offered support, and Cell-Life began to be asked to implement iDART in other university-supported clinics throughout the country.

The first funding for iDART came from the Elton John Foundation and was focused on equipping four sites in rural South Africa with iDART. After that initial funding, iDART was funded indirectly through grants to the various research institutions involved in treatment provision. International AIDS funds, such as PEPFAR (the President's Emergency Plan for AIDS Relief), relied on pharmacy management and reporting capacity to support their treatment plans. Another key enabler of the rollout of iDART was the strong focus on rural clinics. While there was occasionally a sense of "competition" with other software products in the more urban and peri-urban ("township") environments, there was no commercial organization that intended to support rural environments. Highly specialized ARV dispensing functionality meant that Cell-Life and iDART were not generally experienced as competition by stock control and pharmacy software suppliers.

When the commitment from government toward a national rollout grew, it became clear that such a rollout had to include research organizations, many of which had existing treatment programs, as key stakeholders. iDART became part of the rollout as a consequence of early involvement with research sites. This shift brought with it increased complexity at some sites, as the government began to require formal tender and procurement processes. Meanwhile, sites funded by PEPFAR were required to provide specific motivation for using software not developed in the United States.

At the same time, sources of funding diversified. The early model of implementation, in which new sites were assessed individually, and then managed and supported by Cell-Life, was also changing. Broadreach Healthcare, a private company with responsibility for IT systems at several clinics in KwaZulu-Natal, downloaded iDART from Cell-Life's website and proceeded to implement it themselves (Cell-Life was still involved, but mostly in technical training). This model has since been repeated at several other sites. A front office module for general patient data capture was developed by PHRU, which was using iDART at several sites. The open source license made it possible for Cell-Life to integrate the new module into iDART and make it available to other sites.

Analysis

Openness in System Design and Implementation

In the vast majority of projects undertaken in the South African IT sector, whether in business or government, IT systems are acquired by management, developed by technologists, and provided to passive "users" of systems and services. Whether in a Johannesburg corporation or a rural hospital with intermittent water supply, both systems design methodologies and the products and business models of commercial vendors emulate business-oriented models. Progress is explicitly equated with the acquisition of "modern" technology and expertise (Moodley, 2005).

In Cell-Life projects, we have tried to enact a shift toward openness, both in the technologies we work with—preferring open source and open standards—and in the system development process, through the use of iterative and incremental methods, evolutionary prototyping, and participatory design. This has required a shift in attitude from

both the developers of the system and the various user groups. Developers, "specialized [into] academic or professional identities" (Ensor, 2003, p. 342) as technical experts, had to learn to be guided by people whose experiences and modes of expression were often profoundly different from their own. Users, for whom previous engagement with software systems was almost always as passive recipients, needed to work with concepts that were often poorly defined or explained. For most pharmacy users, their involvement was severely time-constrained, balanced with existing work responsibilities that were, themselves, often overwhelming. The complex setting of post-Apartheid South Africa added particular tension to this relationship, as the developer/user divide often also represented a racial, cultural, or language divide.

The urgency of the problem and the highly limited time availability of pharmacists were key to our decision to use working prototypes, which allow users to form opinions based on actual experience of the system. In turn, their responses and suggestions feed into iteratively revised design and new features. This process became a particular strength of iDART, particularly in the early days. Where software users experienced the system as malleable, they were more likely to provide constructive feedback on changes to the initial design. Similarly, designers and developers who spent time with system users, soliciting feedback with a mandate to respond to and explore their needs, became an important proxy for users in prioritizing problem areas.

This was, of course, a balancing act. Constantly responding to user requests for changes to iDART became particularly difficult once the exploratory orientation of the initial research project became secondary to considerations of scale. In the transition phase, when iDART was maturing as a research project and growing in its implementation, pressure to make small, individually requested changes to the system to protect personal relationships needed to be balanced against the need to maintain the technical integrity of the code base, and to align software development priorities with funding. This placed significant strain on the development and implementation teams, and it required constant negotiation. Despite this, relationships had immense value in building and maintaining iDART sites as communities of practice, sustaining knowledge sharing beyond the software itself.

Openness in ICT4D Research

Academic knowledge production is plagued by information silos, both in the way research is produced, and in the dissemination process. Action research, in rejecting positivist claims of independence and emphasizing consensus-building and co-ownership of the research process, aims to address the former. Communities of practice provide a lever with which to understand the latter. Taken together with observations on participation and the role of the researcher, these form the basis for our understanding of openness in the research process.

The collaborative development of software artifacts—as in Blake and Tucker's Socially Aware software engineering—has been a key factor in developing long-term relationships among developers, implementers, researchers, and stakeholder at project sites in all of Cell-Life's work. In the case of iDART, Rivett and Tapson (2009) describe multi-stakeholder collaboration in the implementation community:

> One of the key partners of the iDART development was the Reproductive Health Research Unit (RHRU) of the University of Witwatersrand. RHRU, being at the forefront of the newest developments in side effects, drug dispensing and other related matters, requested changes to iDART on a regular basis. The changes to the system would subsequently result in Cell-Life offering the updates to all other clinics, which benefited in return from the knowledge of RHRU. A pharmacy assistant in a rural clinic in the North West province described iDART as "a knowledge transfer system between universities and community clinics."

Technical knowledge production, too, can happen beyond isolated innovators at universities. In the case of iDART, open source software components were used throughout, and the software itself was released under an open source license. The motivation for this diverged somewhat from other projects, in that attracting contributions from other developers to iDART was not a primary goal. An open source release of the software reflected a philosophical orientation on the part of the developers, and it also provided an induction into a community of open source medical systems developers working on medical records systems (for example, the well-

known OpenMRS system, implemented in several South African sites), mobile data collection systems, and related projects. While collaborative software development is the primary activity of these communities, their existence supports much broader knowledge sharing—both formally, through mailing lists and project meetings, and informally, through relationships between individuals and organizations. The open source model of software development and the community that forms around it are mutually reinforcing. Both the artifact (the software) and the community are also typically in existence for longer than any individual research project, forming a latent network of connections beyond discrete project timelines.

Both situations fit well with the concept of communities of practice, but also they highlight the communities' heterogeneous nature. That which constitutes "actionable knowledge" is likely quite different for a health sciences research group, a small IT-sector NGO, and a pharmacy assistant at the frontlines of the HIV/AIDS epidemic. The success of iDART lies in the way the process (the implementation of a software system for ARV dispensing) and the artifact (the software itself) have been able to serve and engage diverse stakeholders. Being able to engage over an extended period, one long enough for trust to be built and relationships to develop, has been a key factor in allowing this to happen. The same applies to the open source medical systems communities, which, while more technical, are nevertheless heterogeneous in both application area and the kinds of organizations that contribute to projects. Over time, the codevelopment of the software system provides a concrete basis and a common point of reference for knowledge sharing.

Cell-Life's ability to catalyze knowledge sharing through communities of practice depended on its position as an enduring organization with multiple sources of funding. Unlike most university-based research groups, where highly structured research projects are undertaken with predetermined activities and goals, Cell-Life was able to undertake the kinds of small pieces of implementation work that bring experience and build the community. Acting as custodians of the iDART system gave the organization a formal intermediary role, facilitating knowledge sharing among heterogeneous groups. Several core groups in similar open source health systems projects are in a similar position, with the added advantage of wider geographical reach.

In terms of methods, iDART offers a promising model to address the common criticism that development research is undesirably disconnected from policy and practice. Traditional academic work, delineated by narrow specializations, offers no incentive to consider the complex political and structural/institutional limits under which policymakers work (Crewe & Young, 2002). Academic work on failed ICT4D projects is often highly critical, particularly where questions of government expenditure and returns are concerned. This may be useful in accountability terms (although the persistence of expensive and contentious failures suggests some limitations), but it does little to promote mutually influential relationships between researchers and implementing agencies. Instead, it fosters negative perceptions of the potential contribution of academic research. Action research, in which the researcher has a stake in delivering a solution that "works" for all participants, has provided more useful incentives in this regard. iDART developed as a response to a critical problem. The target user group was pharmacy staff working on the frontlines of the HIV pandemic, and the research was evaluated first by how well it met their needs. At one stage, an integration project was undertaken for the eInnovation unit of the Western Cape provincial government (PAWC), providing learning on both sides in a clash of institutional cultures that, ultimately, had to be worked through (and was, with iDART successfully implemented in four PAWC sites). Such a complex, risky, and time-consuming piece of work is unlikely to be undertaken in an academic setting without the incentives provided by action research.

At the same time, the combination of an urgent development problem and an action research response gave rise to the challenge of balancing academic rigor with the awkward compromises that result from a process where everything is understood to be less than ideal. To move from a closed system of expertise—with the researcher as the expert and the research participants as subjects—to open collaboration, shared learning, and co-ownership of the research process requires a fundamental shift at both personal and institutional levels.

In traditional academic terms, iDART has produced a tiny fraction of the peer-reviewed academic

publications (two journal papers, neither in an ICT4D or information systems journal, and four conference papers) that would be expected of any similarly long-running and well-funded project. The nonresearch focus of the various funders involved, and their focus on instrumental evaluations, provides part of the explanation for this. Another reason may be the inadequacy of our research training—in common with many ICT4D researchers—in providing tools for reporting action research. Conversely, the position of Cell-Life as an independent NGO with multiple sources of funding has allowed a much more fluid definition of the goals of the iDART project, one in which the community has some influence, as opposed to just the researchers who write the proposals.

Openness and Development at Universities in the Global South

To reconceptualize the role of ICT4D research in national development, it is important to grapple with what an enabling institutional environment for open models might look like. For the near future, universities are still best positioned to develop such models. However, there remain some important structural barriers that need to be addressed. For example, partnerships across disciplines are key to the success of redefining research—social problems are, by nature, multidisciplinary. Yet discipline-specific journals and conferences are still the dominant means of disseminating academic research. A further barrier is the cost-center approach to research projects, resulting in all projects being hosted within one department or faculty for financial reasons, and thereby tacitly discouraging cross- and multidisciplinary research. Cell-Life, which ran projects between the faculties of health science, engineering, and commerce at various stages, constantly encountered barriers to interfaculty collaboration—and it published far less than similar research projects.

Knowledge sharing through intellectual property is another area that requires re-thinking. IP policies that seem to bedevil the ability to share knowledge require formal mechanisms to exempt certain research and initiatives from their stringent criteria (Rivett & Tapson, 2009). The concept of collaborative open source development, where ownership of software and code is shared among many groups, is often both poorly understood by university IP departments, and poorly addressed in existing guidelines. In the case of iDART, prior work done by Cell-Life in engaging with university management on IP issues was of clear benefit, as the major concerns of both sides had already been aired and addressed. This experience points to the need to establish a critical mass of initiatives with openness as an organizing principle.

The perspective shift described in the previous sections has also highlighted a need to reconsider the skill set of researchers and practitioners. At the level of universities, this means reviewing what is currently taught across a wide range of disciplines, as well as undertaking critical consideration of areas in which, as with research, disciplinary boundaries to teaching are limited in their ability to promote socially responsive approaches. Unfortunately, curricula reviews of existing programs are often biased toward integrating new developments from industry. Attempts to redefine curricula based on local needs face immense barriers, not least in the attitudes of students themselves. Accreditation processes, which specify fixed requirements for curriculum content, impose additional limitations. This is most obvious for programs seeking international accreditations, as was the case in both the undergraduate computer science and engineering programs at the University of Cape Town during the time that Cell-Life was operating there.

As a result, the area in which Cell-Life has been most successful at influencing teaching and learning is not within the general curriculum, but in the supervision of student research projects. iDART was developed in the initial stages as student research. Students benefited by engaging in research within a diverse community of stakeholders, many of whom have very different experiences from their own. Our experience has also been that students who are exposed to socially responsive research often continue to incorporate a development orientation in future work. If the role of universities is to serve the public good, sensitizing students to the development potential of their field is extremely valuable.

A final point on institutional arrangements for ICT4D research concerns engagement with institutional stakeholders beyond the university. In the case of iDART, engagement with multiple levels of government was essential to ensure not only the fit of the system in its immediate context, but also its position in relation to other systems and policy

Table 2. iDART Case Analysis Summary.

	System design and implementation	ICT4D research	Openness and development at universities in the Global South
Universal over restricted access to research products	Developing and participating in communities of practice around open source medical systems in the developing world	Research-policy-practice links; action research in context and with a clear organizational outcome; and acceptance of multiple accountabilities: funders, implementers, patients, academic community	Developing and participating in communities of practice around ARV delivery
Universal over restricted participation in the research process	Design by constraints of remote clinics and the public health sector, evolutionary prototyping, time-sensitive training and design sessions with pharmacy staff	Engagement with multiple stakeholders (government, medical/pharmacy professionals, frontline users), action research approach, long timelines	Retraining researchers and students as facilitators/resources, engaging with practitioners as informants for both content and direction of research
Collaborative over centralized production of knowledge, and recognition of diversity in knowledge systems	Longevity of software artifact beyond individual project timelines, sharing of feature requests and innovation through access by distribution clinics to a common software system, and awareness of alternative IP models	Collaboration (disciplinary, researcher-practitioner) catalyzed by a critical development problem, development and support of enduring communities of practice	Challenges of interdisciplinarity within university structures, interfaculty research teams, teaching outside of internationally recognized syllabi, and nontraditional dissemination channels for research products

directions—all of which evolved rapidly as the government grappled with HIV management. Engagement with the private sector at various points also proved essential in developing a foundation for system support at scale, beyond Cell-Life's own capacity.

In achieving cooperation among institutions, iDART is indebted to the process focus and long timelines of action research. The e-government literature has explored productive engagement with government, but perhaps has failed to emphasize the long timelines necessitated by approval processes, staffing constraints, and budget processes. In relation to the private sector, the advent of iDART as a research collaboration made possible the developments of the system that were risky—new, poorly specified, and serving a notoriously difficult sector. The initial research focused on allowing the functional and operational requirements of the new field of antiretroviral dispensing to emerge (Brown et al., 2006). As the focus shifted to broader implementation, the need for flexibility beyond what was available in a university environment resulted in Cell-Life being spun off as a separate nonprofit entity. Because of a shared understanding of the project developed during Cell-Life's multi-year engagement with the University IP office, we were able to negotiate IP policies (in Cell-Life's case, an open source model) that were flexible enough to accommodate the shift.

Conclusion

The concept of open development usefully frames reflections on iDART as a research-based response to a critical development problem. Over the past 10 years, the project has proven its ability to scale up alongside the ART rollout, and in the process, it has negotiated a transition in its own identity from a university research group to an implementation-focused nonprofit.

Both the system design and the research methods were chosen with the intention of widening participation. In both cases, participatory methods proved both highly valuable, and severely constrained by the time-limited nature of participants' work.

- In system design, evolutionary prototyping and the development of working prototypes emerged as a valuable method for enabling user participation in the system design process, while also creating a shared sense of the malleable nature of the systems among users, developers, and researchers.
- Participatory action research and involvement with wider open source developer communities contributed to the development of communities of practice, which added diverse stakeholder involvement and the ability to endure beyond individual implementations and systems.

iDART also established the value of a long-running action research approach, where projects are developed over the course of several years, to build a shared, context-sensitive understanding of the system. Openness and cocreation are impossible without relationships at ground level, built in increments as trust is slowly established, and in turn, fundamental to the process of shared development. This matrix of relationships then supports flexible systems and communities, able to reconfigure themselves over the life cycle of the system.

Action research sees the researcher developing into a resource to the project community, rather than remaining an uninvolved observer of a process. By adhering to this principle, iDART succeeded in promoting wider access to research products—both the software and the distributed knowledge developed and shared in the community. However, this came at the expense of traditional academic publication. Action research is challenging to report out of context. The multi-disciplinary nature of the project further complicated its relationship with academia in the relatively rigid, professionalized disciplines of medicine, engineering, and computer science.

In terms of knowledge production, it is clear that the realization of universities as developmental institutions requires a far wider range of expertise in ICT4D than is usually available in the limited fields of information systems and computer science. On an organizational level, universities often struggle to accommodate projects that span disciplines and feature long timelines, diverse stakeholders, and nontraditional knowledge outcomes. Experience within the university in managing these kinds of projects can lead to productive engagement.

The experience of iDART demonstrates important benefits of open approaches to research, despite practical and structural challenges. Efforts to increase awareness of open alternatives among researchers and practitioners should be supported, and the results should be evaluated critically by the ICT4D community. ■

References

Blake, E., & Tucker, W. (2006). Socially aware software engineering for the developing world. In P. Cunningham & M. Cunningham (Eds.), *IST-Africa 2006 conference proceedings.* Dublin: International Information Management Corporation.

Bekker, L.G., Orrell, C., Reader, L., Matoti, K., Cohen, K., Martell, R., Abdullah, J., & Wood, R. (2003). Anti-retroviral therapy in a community clinic: Early lessons from a pilot project: *South African Medical Journal*, *93*(6), 458–462.

Brett, E. (2009). *Reconstructing development theory: International inequality, institutional reform and social emancipation.* Houndmills, Basingstoke, UK: Palgrave Macmillan.

Brown, S., de Jager, D., Wood, R., & Rivett, U. (2006). A pharmacy stock control management system to effectively monitor and manage patients on ART. *The 4th institution of engineering and technology seminar on appropriate healthcare technologies for developing countries,* (pp. 27–36).

Byrne, E., & Sahay, S. (2007). Participatory design for social development: A South African case study on community-based health information systems. *Information Technology for Development, 13*(1), 71–94.

Chambers, R. (1995). Poverty and livelihoods: Whose reality counts? *Environment and Urbanization, 7*(1), 173.

Chambers, R. (1999). *Rural development: Putting the last first.* London: Longman. Retrieved October 14, 2009, from http://www.eou.edu/socwomen/support/articles/chambers.pdf

Checkland, P. B., & Scholes, J. (1989). *SSM in action.* Chichester, UK: John Wiley & Sons Ltd.

Cooke, B., & Kothari, U. (Eds.). (2001). *Participation: The new tyranny?* London: Zed Books.

Crewe, E., & Young, J. (2002). Bridging research and policy: Context, evidence and links. ODI. Retrieved October 7, 2009, from http://www.odi.org.uk/resources/odi-publications/working_papers/wp173.pdf

Dada, D. (2006). The failure of e-government in developing countries: A literature review. *The Electronic Journal of Information Systems in Developing Countries, 26.*

Ensor, P. (2003). The national qualifications framework and higher education in South Africa: Some epistemological issues. *Journal of Education and Work, 16*(3), 325. doi:10.1080/1363908032000099476

Gibbons, M., Limoges, C., & Nowotny, H. (1994). *The new production of knowledge: The dynamics of science and research in contemporary societies.* London: SAGE.

Health Systems Trust. (2005). Health Statistics 2005: Health Personnel. Available at: http://www.hst.org.za/healthstts/102/data

Hearn, G., & Foth, M. (2005). Action research in the design of new media and ICT systems. In K. Kwansah-Aidoo (Ed.), *Topical issues in communications and media research* (pp. 79–94). New York: Nova Science.

Heeks, R. (1999). The tyranny of participation in information systems: Learning from development projects. Retrieved October 29, 2009, from http://unpan1.un.org/intradoc/groups/public/documents/NISPAcee/UNPAN015538.pdf

Heeks, R. (2002). Information systems and developing countries: Failure, success, and local improvisations. *The Information Society, 18*(2), 101. doi:10.1080/01972240290075039

Heeks, R. (2003). eGovernment for development: Success/failure rates survey overview. Retrieved January 6, 2008, from http://www.egov4dev.org/sfoverview.htm

Heeks, R., & Bailur, S. (2007). Analyzing e-government research: Perspectives, philosophies, theories, methods, and practice. *Government Information Quarterly, 24*(2), 243–265.

Hirschheim, R., & Klein, H. K. (1989). Four paradigms of information systems development. *Communications of the ACM, 32*(10), 1,199–1,216.

Kallinikos, J. (2004). Farewell to constructivism: Technology and context-embedded action. In C. Avgerou, C. Ciborra, & F. Land (Eds.), *The social study of information and communication technology: Innovation, actors, and contexts* (pp. 140–161). Oxford: Oxford University Press.

Moodley, S. (2005). The promise of e-development? A critical assessment of the state ICT for poverty reduction discourse in South Africa. *Perspectives on Global Development and Technology, 4*(1), 1–26.

Mumford, E., & Weir, M. (1979). Computer systems in work design: The ETHICS method. London: Associated Business Press.

Nowotny, H., Scott, P., & Gibbons, M. (2003). Mode 2 revisited: The new production of knowledge. *Minerva, 41*(3), 179–194.

Pardo, T. A., & Scholl, H. J. (2002). Walking atop the cliffs: Avoiding failure and reducing risk in large-scale e-government projects. *Proceedings of the 35th annual Hawaii international conference on system sciences,* 1,656–1,665.

Rabinovitch, J. (2004). *Transforming community practice: [Re]moving the margins.* Union Institute. Retrieved October 2, 2009, from http://web.uvic.ca/ocbr/assets/pdfs/JRabinovitch_dissertation.pdf

Reason, P., & Bradbury, H. (2007). *The SAGE handbook of action research: Participative inquiry and practice.* London: SAGE.

Rivett, U., & Tapson, J. (2009). The Cell-Life project: Converging technologies in the context of HIV/AIDS. *Gateways International Journal of Community Research and Engagement, 2,* 82–97.

Smith, M. L., & Elder, L. (2010). Open ICT ecosystems transforming the developing world. *Information Technology & International Development, 6*(1), 65–71.

Soeftestad, L. T. (2001). Aligning needs and means. On culture, ICT and knowledge in development cooperation. *24th information system research seminar in Scandinavia (IRIS-24),* (pp. 47–60). Retrieved October 2, 2009, from http://

rmportal.net/library/content/frame/aligning-needs-and-means.pdf

South Africa Department of Health (DOH). (2007). *South African national strategic plan for HIV/AIDS and STI 2007–2011*. Department of Health.

Thompson, M. (2004). Discourse, "development" and the "digital divide": ICT and the World Bank. *Review of African Political Economy, 31*(99), 103–123.

Vaillancourt, Y. (2005). Democratizing knowledge: Research experiments based on university-community partnerships. Retrieved October 2, 2009, from http://www.fimcivilsociety.org/en/library/Democratizing_Knowledge.pdf

Williams, R., & Edge, D. (1996). The social shaping of technology. *Research Policy, 25*(6), 865–899.

Wilson, F. (1997). The truth is out there: The search for emancipatory principles in information systems design. *Information Technology & People, 10*(3), 187–204.

Wilson, G. (2007). Knowledge, innovation and re-inventing technical assistance for development. *Progress in Development Studies, 7*(3), 183.

Wood, R., Kaplan, R., Bekker, L. G., Brown, S., & Rivett, U. (2008). The utility of pharmacy dispensing data for ART programme evaluation and early identification of patient loss to follow-up. *Southern African Journal of HIV Medicine, 9*(2), 44.

Research Article

Designing Research for the Emerging Field of Open Development

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Abstract

This paper departs from the observation that empirical and conceptual frameworks describing the intersection of new technology and development studies have begun to embrace the idea of open development. Frameworks for research, however, continue to reflect older notions of technology appropriation and empowerment. In order to start a dialogue about research design appropriate to open development, I provide an overview of key ontological, epistemological, and methodological considerations of significance to this field. An open development approach, I argue, should focus on enhancing cognitive justice rather than productivity or empowerment. This can best be carried out through the application of a constructivist and critical realist epistemology, through positional methodology and through networked research processes.

Introduction

According to Gumucio-Dagron and Tufte's comprehensive 2006 anthology of theories of development communication, the emergence of the Internet gave rise to new thinking about how communication conditions progress.[2] As they explain, in a 1999 report written for the United Nations Research Institute for Social Development (UNRISD), Manuel Castells argued that new ICTs formed the basis for productivity and organization in the new global network society, polity, and economy (Castells, 2006/1999, p. 951). Following this logic, intervention was required to ensure that developing countries had access to the means to participate in a networked globe, lest they be left stranded on the other side of a digital divide that marked a structural separation between developed and developing worlds. This gave rise to a body of work focused on closing the digital divide through greater access, use, and appropriation of new communication tools and techniques made possible by the Internet (Robinson, 2006/2004; James, 2005).

1. Thank you to Rick Gruneau, Matthew L. Smith, Scott Timke, and the anonymous reviewers of this article for their valuable comments and suggestions.

2. They call this school Information Society and Communication Rights. See Gumucio-Dagron and Tufte, p. xxxv, for their explanation. They contrast it with Power, Media, and the Public Sphere; Social Movements and Community Participation; and Popular Culture, Narrative, and Identity. This proves a good reflection of the actual academic division of labor in the field of development communication: The Communication Portal (www.portalcomunicacion.com) of the Autonomous University of Barcelona provides a window on Spanish-language communication resources. The Latin American regional academic networks dedicated to communication studies divide themselves into semiotics, social communication, complexity, the information society, and the political economy of ICTs. The latter two divisions would fall under the umbrella of information society and communication rights.

Table 1. Key Questions Driving the Research Process.

Aspect of Research	Question
Ontology	What is the nature of the reality to be studied?
Epistemology	What can be known about this reality, and how can it be known?
Methodology	How can the knowledge be acquired?
Methods	What procedures can be used?

Source: Adapted from Grix, 2002, p. 180.

Other scholars, however, have questioned the wisdom of facilitating access to information and knowledge as a means to create development. Drawing on the work of Allan Kaplan, Cees Hamelink argues that development should not be conceived of as a process of engineering that depends on the delivery of information and knowledge, but rather, as a process that "enables people to participate in the governance of their own lives" (Kaplan, 1999, p. 19, as cited in Hamelink, 2002, p. 8). With this in mind, Hamelink concludes that, "the real core question is how to shape 'communication societies.' In fact for the resolution of the world's most pressing problems we do not need more information processing but the capacity to communicate" (ibid.).

In this article, I argue that Hamelink's work is compatible with open development, and that this paradigm needs to be accompanied by new frameworks for research. I frame this discussion around four key questions that drive the research process, as laid out in Table 1. This framework views research in a particular way. Specifically, it presupposes that *all* research starts from a set of assumptions about the nature of our social and political reality. These "ontological priors" drive the types of research questions we ask. How we answer those research questions then depends on our epistemological commitments—in other words, our beliefs about how knowledge can be produced. In turn, our epistemological commitments drive our methodological choices: how we design research and how we gather data. Some readers will object to this model, since it is not always clear that ontology drives epistemology, which drives methodology. However, I am using it because it offers a useful starting point for thinking about how to design research.

With this in mind, in what follows, I first identify and critique the ontological priors underlying core research questions posed by scholars working in the area of ICT4D. I then extend an alternative set of assumptions appropriate to open development. Specifically, I argue that either ICT4D starts from the assumption that development should ensure the productive insertion of the Global South into the information society, or that development should empower local actors to resist the globalizing forces of the information society. Open development, I argue, should start from the assumption that development aims to ensure cognitive justice, such that the protagonists of development can make their own determinations. After exploring the notion of cognitive justice and the implications of this alternative starting point for research questions, the balance of the article explores implications for epistemological commitments, research design, methods, and sources.

Popular Starting Points

Ontological priors are answers to the question, "What is the nature of the reality to be studied?" In this section, I consider ontological starting points underlying research on ICT4D. Social science research on ICTs goes by many different names (He, 2003; Coward, 2009), a fact that presents a challenge when trying to identify and compare ontological starting points. The difficulty lies in a lack of clarity about how this wide-ranging scholarship understands the link between ICTs and social change (Avgerou, 2010; Unwin, 2009). Focusing on informatics is a step toward resolving this problem. Both the International Development Informatics Association and the University of Manchester's Centre for Development Informatics use the term "development informatics" (DI) interchangeably with "ICT4D." But as Heeks explains, "We prefer the term 'development informatics' to 'ICT4D' because the former is less technocentric and allows

an equal focus on information, knowledge, and information systems as well as on ICTs" (2006, p. 2). In other words, informatics puts the focus on processes of social change, rather than on the technology itself (Kling, 1999, 2000; Kling, Rosenbaum, & Hert, 1998).

Of course, social change can be thought of in very different ways, and this has important implications for how development interventions or development research can be oriented. So, for example, *social* informatics (SI) is "the interdisciplinary study of the design, uses and consequences of information technologies that takes into account their interaction with institutional and cultural contexts" (Kling, 1999, p. 1). Following this logic, it is specifically concerned with questions such as: *How does the technology enable a particular target group?,* or *What do user groups seek from a given technology?* SI has been influential in the field of ICT4D (Nurminen, Berleur, & Impagliazzo, 2006, pp. 2–3); however, it has tended to embody a Western and organizational bias (Raiti, 2007). Given that it is primarily oriented toward theorizing the processes involved in technology adoption, there is the suggestion that it might serve the agendas of the Western development machine or Western corporate interests (Nyamnjoh, 2006/1996). These features of SI mean that, as an inspiration for thinking about ICT4D, it has tended to embody modernist assumptions, favor top-down or corporate-led development, and focus on *productivity.*

Community informatics (CI), on the other hand, works specifically on the question of how ICTs can contribute to community development (Pigg, 2001). Gurstein defines CI as "the application of ICT to enable community processes," with the goal being, "the achievement of community objectives including overcoming 'digital divides' both within and between communities" (Gurstein, 2007, p. 11). For adherents to this approach, research needs to ensure that ICTs empower communities in such ways that they regenerate themselves, become stronger, and defend their borders against negative incursions by capital or authority. The major questions facing CI, therefore, are "how communities can become the 'subject' of technology applications and how technology in turn can enable communities to become more active, effective and secure as 'subjects'" (Gurstein, 2007, p. 36). Because of these underlying assumptions, the main agenda driving CI is *empowerment.*

These examples suggest a contrast between SI research, which seeks to understand productive adoption of ICTs in developing countries such that they can become part of the new global information economy, and CI research, which seeks to understand community appropriation of ICTs such that they can resist incursions by global, corporate, top-down forces operating within the global information economy. This characterization of ICT4D research mirrors Avgerou's distinction between transfer and diffusion models versus social embeddedness models of change (2010), as well as Unwin's distinction between development based in an empirical-analytic theory of social science and that based in a hermeneutic tradition (2009, p. 33).

The field of development has itself been evolving in response to both theoretical impasses (Brett, 2009; Schuurman, 1993) and empirical failings (Easterly, 2006). Those searching for alternatives have had to construct new foundations for thinking about development. This search has given rise to an "ontological turn" in development studies (Escobar, 2007) which responds to the need to move beyond either grand narratives or paralyzing theoretical moves (such as deconstructionism), and to establish critically realist (Unwin, 2009, p. 33) and historically contextualized footing (Avgerou, 2010, p. 11) for the theorization of effective development alternatives. This implies a wholly different vision of the networked world: neither a globocentric vision of the consolidated network society nor a nostalgic and nationalistic vision of resistance, but a focus on specific contexts for development and the real processes of dynamic change that take place within them. As Hamelink argues, drawing on Kaplan, "'It is important for us to understand that as development workers we do not 'bring' or deliver development, but intervene into development processes which already exist.' Contrary to the conventional approach, 'development is about facilitating resourcefulness'" (2002, p. 8). It is on this footing, I argue, that we must develop the idea of open development.

This shift implies the need to move beyond either productivity or empowerment as anchoring concepts for development in ICT4D research. Rather than modeling subjects as either productive contributors to an information society or empowered upholders

of defensive stances, what I want to focus on is a need for a system of protections that recognizes, celebrates, and shelters situated, emergent *intent* (see Buskens, this issue). As Kaplan defines it, development is "an innate and natural process found in all living beings" (Kaplan, 1999, p. 8), and therefore, as Unwin explains, ICT4D needs to "engage in critical science that encourages a form of self-reflection that will enable the systematically distorted patterns of communication in society to be revealed for the benefit of all" (2009, p. 33). I am going to call this system of protections "cognitive justice." In other words, I want to move from theorizing that presumes the nature of the world, its threats, and its ideal subjectivities, to theorizing that starts from a position of openness in processes of change and subjectification.

Why reject productivity and empowerment organizing principles and end-goals for thinking about open development? When productivity is linked with a particular vision of the global economy, it is not difficult to imagine why we would question its legitimacy as a starting point for thinking about open development. The critique here is that the productive subject under informational capitalism is just as disenfranchised as the productive subject under industrial capitalism, because in either case, the subject is merely a source of labor within a capitalist system. Neither the future nor the present are "open" under such conditions, since the conditions for life are foreclosed by the system of production. Empowerment is generally seen as the antidote to this problem. Theories of participation suggest that empowerment can either lead to the social contract that keeps capitalism in check, or to the revolution that transforms it. But there are problems with empowerment, as well.

Empowerment seeks to give people critical thinking skills so that they can both learn for themselves and question the system in which they learn, such that they can shape the system around their goals (see, for example, Kabeer, 1994, ch. 9). Following Freire (2007), educational processes that unveil the power relations that shape our reality are a means to create empowered individuals. By extension, Parpart, Rai, and Staudt argue that "empowerment must be understood as including both individual concientization *(power within)* as well as the ability to work collectively, which can lead to politicized *power with* others, which provides the *power to* bring about change" (2002, p. 4, emphasis in the original; see also Rowlands, 1997).

But, as Parpart mused in a recent talk at the University of Toronto, when empowerment is taken up as an agenda by development practitioners, it is frequently imbued with a dualistic ethos. People are without empowerment, and then, as a result of a technical intervention, they "get" empowered. This means that being empowered becomes something to be measured, something that can be accumulated—an achievement, a goal, a standing (Parpart, 2009). Freire assumes the educator is herself pure, moving outside of the influence of power, and yet many practitioners of empowerment are working with people as a means to achieve very specific political ends. An education process based in patriarchy empowers students in a very different way than an education process based in capitalism. The blinders do not simply come off; they are replaced with a pair of glasses that show the world in a specific way. The risk, then, is that empowerment becomes a strategy within a particular field, and thus *it becomes a tool of mobilization into a perspective.* When empowerment becomes a means to mobilize, it is actually *disempowering,* because it constructs subjects such that they can occupy a particular agenda. Empowerment is important for enabling change, but we must question its limits when it becomes part of a practice of power.

In ICT4D, both productivity and empowerment start from the assumption that the network society model of capitalism is homogeneous and, if not ubiquitous, then dominant. The productivity model responds to this assumption by preparing all people equally for the introduction of a universal program. The empowerment model responds by creating enclaves of resistance against this model. In either case, there is a bias in the way that we think about the nature and impacts of the information society. This is a bias that fixates on bounded network *spaces*—as Castells said, "Be in the network, and you can . . . increase your chances. Be out of the network . . . and your chances vanish" (2006/1999, p. 953)—rather than on the *processes* of cognition and computation through which actual development takes place.

An Alternative Starting Point

There is no clearly defined field of development informatics (DI), but if there were, I believe that it

would best follow Hamelink in taking up a model based in communication. I believe that such a model is better positioned to capture the empirical reality of development, and to facilitate locally relevant approaches to development. Rather than empowering people into space-bound or identity-bound perspectives, or equipping them for a single possible future, DI would facilitate and protect the conditions that give rise to flexible, dynamic, local processes of innovation, experimentation, and resilience. Such a perspective is arguably more appropriate for open development, and it is a position supported by the recent work of prominent development theorists. As Easterly argues, "democracy as an ideal is about expanding the share of free people in society who are allowed to solve problems using their own knowledge" (2010). Sen argues that "There is no particular 'compulsion' either to preserve departing life styles, or alternatively, to adopt the newest fashion from abroad, but there is a need for people to be able to take part in these social decisions" (2004, pp. 55–56). And, focusing more specifically on research, Bebbington explains that:

> Power, meaning, and institutions are constantly being negotiated, and these negotiations open up spaces for potentially profound social and institutional change. Understanding how these spaces open and how they are used is a critical research challenge, and will take us beyond some of the oppositions that haunt much development theory. (2000, p. 497)

What is required, then, is a concept that captures the core of open development. Rather than seeing ICTs as wrapped up in promoting productivity or enabling empowerment, open development can be understood as the recognition that our task is the promotion and protection of cognitive justice. Cognitive justice is a normative agenda that directs attention to development's spaces and practices, and away from the construction or celebration of development agendas and discourses. It is the idea that no one form of knowledge should dominate at the expense of others, but rather, that different forms of knowledge should exist in dialogue with each other (van der Velden, 2005; Visvanathan, 2002; Santos, 2007). More specifically, van der Velden defines this as "the diversity of knowledge and the equality of knowers" (2006, p. 2). She argues that it is not a relativist concept (as has been suggested by Nanda, 2003), but rather, a dialogic concept. Thus, we must:

> perceive people's actual behaviour, an expression of their culture and ethics, as a way of knowing, not as a tradition from the past, a superstition that can be "museumised," excluded from the debates on their futures. . . . The supposed validity of people's knowledge lies not . . . in the fact that there are diverse ways of knowing. . . . Their relative validity will be realized through their inclusion in the heuristic dialogue between (conflicting) knowledges. It is in this sense that these different ways of knowing are valid: they should be treated equal in terms of access to and participation in dialogues of knowledges. (van der Velden, 2006, p. 14)

By extension, the notion of cognitive justice implies that the structure of social networks and systems for knowledge production must also support diversity and dialogue. The value of this approach is that it centers research on the complex, situated processes of development that actors engage in as they try to overcome barriers to their well-being and create more innovative, experimental, resilient communities. We do not presume the nature of the information society or of its potential outcomes, thus curtailing open processes of subjectification, but rather, we observe, celebrate, and foster transformative initiatives that are engaging shifting realities at multiple scales.

Thus, what is at stake for ICT4D are the conditions under which communication can lead to exploration and innovation, and ultimately, the moments of change referred to by Bebbington. Open development should study the ways in which networks—both in their physical and parallel social/ideational sense—are negotiated, and how spaces for change are opened or closed within these processes of negotiation. It should ask: *How do processes of network and networked negotiation produce or limit cognitive justice for variously situated actors within, between, and outside of networked spaces? How do these processes affect possibilities for change or stasis wherever, on whatever scale, across whatever distances or cultures, and through whatever media they might take place?* Rather than empowering people to mobilize within groups to create changes in "the wider world," this is about studying (and facilitating) the types of networking interactions that offer small opportunities for innovation and change

throughout society. The objective should be research that seeks to enhance cognitive justice such that actors become the subjects of their own histories, and not the agents of political agendas. In a world of complex interactions, these small changes may eventually lead to cascades of change that could bring about larger shifts in our social organization.

Epistemological Commitments

In the act of carrying out investigations, researchers necessarily enter into the information systems they are trying to study. This raises an especially significant dilemma for research that poses cognitive justice as a goal: How is it possible to study processes of knowledge production such as innovation, experimentation, or development without contributing to ontological closure, and thereby undermining cognitive justice? Insofar as *information* or *network* technology becomes an entry point into questions about the production of frameworks and categories for social change, as researchers, we must necessarily consider our epistemological commitments.[3] In other words, researchers must consider their answer to the question, "What can be known about this reality, and how can it be known?"

When it comes to open development, we need an epistemological framework that moves beyond the impasse between realism and deconstruction in development studies. Both of these frameworks put important limitations on open development research insofar as it seeks to promote cognitive justice—the former because it limits cognition (positivism maps social facts onto subjects rather than studying how subjectivities emerge), and the latter because it provides no grounds for justice (deconstruction serves to unravel assumptions but leaves us without alternative starting points). Constructivists have offered a variety of avenues for moving ahead; here I argue that critical realism is the appropriate constructivist epistemology for a program of open development.

Constructivists argue that knowledge about the world is produced by people; hence, there are no universal truths, and yet we can learn much by studying the production of knowledge. There are many varieties of constructivism. Both radical, anti-foundationalist constructivists (Kratochwil, 2000) and pragmatic constructivists (Chernoff, 2009) are concerned with how confidently we can know something, and both arrive at the conclusion that it is better to avoid *claiming* to know altogether. Thus, radical constructivists argue for an intersubjective criteria of validity. The solution is to behave "as if" the values, ideas, or identities of a particular group were true—that theories of the social world are best built based on "social facts," which are the intersubjectively naturalized ideas constructed by social agents. These social facts provide a foil against which social science researchers can explain the emergence of socially held "truths." As constructivist scholar Pouliot argues, "Ultimately, to know whether a social fact is 'really real' makes no analytical difference; the whole point is to observe whether agents take it to be real and draw the social and political implications that follow" (2007, p. 364). Meanwhile, taking an instrumentalist or pragmatic approach, Chernoff argues that what is really important is the "cash value" of our beliefs—whether they make action possible and successful in the real world.

Both foundations for theorizing are troubling because they allow researchers to take categories such as "information society" for granted, and, as was explained in the previous section, this lends credence to discourses that become power resources within change processes. In more theoretical terms, Wight worries that the position taken by radical and pragmatic constructivists lets us off the hook, that "getting things right is a practical, a political, and an ethical imperative" (2007, p. 381), and even if we cannot achieve this goal, we should still try. In my view, "getting things right" is about *not* taking discourses at face value—*not* selecting categories just because they serve instrumental ends. The values, ideas, or identities that people "take to be real" are often not representative of the "social facts" that actually shape their experience, nor of their true desires. Given the role of popular intellectuals (Baud & Rutten, 2004, p. 8) in shaping public perceptions within networked spaces, there is a risk that the "social facts" encountered by researchers are actually discursive claims or rhetorical devices emerging from a particular theoretical perspective or political

3. A reviewer points out that this ontological closure only becomes a problem when researchers deny their interaction with the world in processes of knowledge production. The point is to acknowledge this truth and think through how this interaction will be understood and operationalized.

agenda. Kowtowing to the instrumentalism of others prevents us from uncovering processes of knowledge production and practices of power that may limit cognitive justice. As such, both radical and conventionalist constructivism serve as poor bases for examining the processes that result in a particular pattern of social change. These frameworks leave us unable to assess whether, how, and to what extent a particular set of circumstances constrains or encourages openings for new thinking.

The alternative compromise is a critical (or scientific) realist take on constructivism, which argues that "part of the rationale for science is the attempt to know whether or not things are really as described, and what it is that makes them appear as such" (Patomaki & Wight, 2000, p. 218). This approach is based on three key assertions: 1) that "there is a reality independent of the mind(s) that would wish to come to know it" (ontological realism); 2) that all beliefs are socially produced (epistemological relativism); and 3) that all the same, "it is still possible, in principle, to choose between competing theories" (judgmental rationalism) (ibid., p. 26; see also Danermark et al., 2002). In practice, critical realism asks that researchers seek out reality while also recognizing their role in constructing it. This answer to the question of how we can know reality provides a foundation to the ontological turn in social science.

I believe that, as a philosophical foundation, critical realism is consistent with the agenda of cognitive justice for two reasons. First, critical realism upholds epistemological relativism and is methodologically agnostic. This means it is inherently accepting of multiple, unconsensuated or contested knowledges and the various processes through which they are generated. Second, critical realism's commitment to an ontological basis for reality provides a basis for *ensuring* cognitive justice. As Adler explains, "Critical constructivists . . . share the view that striving for a better understanding of the mechanisms on which social and political orders are based is also a reflexive move aimed at the emancipation of society" (Adler, 2002, p. 98). Unless we base research in realism, it will be difficult to identify and address the mechanisms and power relations underlying information, knowledge, and cultural production. If we cannot do this, then it will be impossible to establish whether and when these systems unjustly limit particular ways of knowing or processes of knowledge production, thereby limiting processes of open development.

Methodology: Designing Research for Cognitive Justice

A third issue facing researchers is the methodological question of how knowledge can be acquired given ontological priors and epistemological commitments. Positivist research epistemologies generally employ quantitative research techniques, while interpretivist epistemologies tend to turn to qualitative techniques. But in open development (as it has been defined in this paper), the major issue shaping knowledge acquisition is not technique, but location. This is particularly true given Avgerou's argument that ICT4D researchers must find ways to connect contextualized studies of how ICTs impact local processes of social change with the macro political-economic contexts that condition development (2010, p. 12). Researchers can be agnostic about how they gather data, but they must pay attention to how they define their cases. ICT4D research often includes assumptions about primary sites for research (organizations and communities, respectively), but open development offers no clear answer about where to situate research. It considers a world in which networked information, knowledge, and cultural production are happening everywhere, all the time, in complex and interrelated ways, and thus, I will argue that it needs to be based on a process-oriented approach that can take into consideration the openness and complexity of social systems.

Ethnography has been grappling with the problem of knowing "the local" when it is no longer geographically situated. The solution put forth by ethnographers is to pursue multisite research that "moves out from the single sites and local situations of conventional ethnographic research designs to examine *the circulation of cultural meanings, objects, and identities in diffuse time-space*" (Marcus, 1995, p. 96, emphasis mine; see also Hannerz, 2003). In this type of work, "research is designed around chains, paths, thread, conjunctions, or juxtapositions of locations in which the ethnographer establishes some form of literal, physical presence, with an explicit, posited logic of association or connection among sites that in fact defines the argument of the ethnography" (Marcus, 1995,

p. 105). In research involving ICTs, the researcher might form these connections entirely in allegorical space (Lindlof & Shatzer, 1998), or she might trace the ways material constructs, computer code, networks, or epistemology impose directionality or pattern on allegorical flows (MacKenzie, 2006).

This approach provides a "work-around" to the problem of site selection in a networked world. However, it introduces the problem of positionality when it "ethnographically constructs aspects of the system itself through the associations and connections it suggests among sites" (Marcus, 1995, p. 96). As Hannerz explains:

> [N]either I nor my colleagues could claim to have an ethnographic grasp of the entire "fields" which our chosen research topics may have seemed to suggest . . . and this tends to be in the nature of multi-site ethnography. . . . multi-site ethnography almost always entails a selection of sites from among those many which could potentially be included. (2003, p. 207)

Accordingly, Molyneux worries that, "Since any ethnographic account of development and globalization is necessarily partial and selective, at best it can provide a focused illumination of a complex whole" (2001, p. 273).

One solution is to focus on process. For example, Nagar's work (2003) has focused on the production of local knowledge, in particular through studying life histories, especially those written in the words of local actors. In this way, the research gives priority to local interpretations while also considering the means through which knowledge is produced in the chosen research context. This is not unlike the collection of stories by ICT4D scholars (see, for example, DFID, 2005, p. 31). But it is important to note the difference between collecting "success stories" to *justify* ICT4D projects, and collecting locally produced accounts of locally relevant histories as a means to *understand* local knowledge production practices, however those might occur. In the latter case, the researcher is open to the possibility that ICTs might have a negligent or negative role in processes of social change.

Another approach is to focus on the production of spaces (cases, phenomena, concepts, groups, etc.), rather than to assume their parameters. Borders are the result of internal processes rather than arbitrary theoretical assertions, and systems become "verbs not nouns, as they are sites of struggle and relational effects that reproduce themselves" (Henry, Mohan, & Yanacopulos, 2004, p. 850). Following Portugali, borders represent different forms of information compression that result from the social production of space and place (2006, pp. 659–660). Both geography and history offer theoretical frameworks for thinking about such processes. For example, humanist geographers Henri Lefebvre (1991, 1996) and Edward Soja (1989, 1996) provide a useful set of spatial concepts for examining the constitution of spaces for networking. They distinguish between *spatial practice* (the perceived, empirical, visible organization of material space), *representation of space* (how space is conceptualized, abstracted, socially constructed, and politically contested), and *spaces of representation* (how space is subjectively experienced by its "users"). By extension, using the work of historian Michel-Rolph Trouillot, history could be thought of as a "space" that is "written" by the confluence of *structurally situated agents* who experience events given both the historically and geographically situated set of capacities afforded them as *actors,* and the voice afforded them as *subjects* with a particular purpose (Trouillot, 1995, p. 23).

Studies of the production of networked space constitute a finding in themselves, but we need to go further if we are to understand the mechanisms that give rise to these findings. Multi-site ethnography, spatial, and life-history techniques can provide a snapshot of *how* networks and flows are organized, but they will not provide a full answer as to *why* they are organized in that way. Further research is required to uncover the factors that both condition and cause networks to be accessible or beneficial to some people, but not to others. Here, we encounter a second challenge, which is that of untangling causal mechanisms in complex causal processes. As Wight explains: "Causality in [complex] systems is both networked and summative, making it very difficult, if not impossible, to untangle the contribution of individual causal mechanisms, or combinations of them, in explaining specific outcomes" (Wight, 2008, p. 21). Human actors participate in many systems simultaneously, making it difficult to identify the sources of influence on any given system. Furthermore, a typical social system will exhibit various "emergent lev-

els," as well as a variety of interacting feedback loops.

One solution to this problem is the use of process tracing to establish an account of the conditions and mechanisms that give rise to particular outcomes. Process tracing is the practice of "generating and analyzing data on the causal mechanisms, or processes, events, actions, expectations, and other intervening variables, that link putative causes to observed effects" (George & Bennett, 2005, p. 214, fn. 25). For example, if the observation is that men are much more likely than women to access the computers in a telecenter, then the underlying condition might be a particular practice of patriarchy. Patriarchy is not an explanation, however; nor can patriarchy be assumed equal in all societies or cultures. The research must explain how a specific practice of patriarchy is put into action through specific mechanisms that make it more likely for men than for women to access the computers at the telecenter. This work will produce an account of the conditions and social practices that give rise to higher male use of a telecenter. The account can then be refined through interactive abstraction until "the alleged generative mechanisms are robust and powerful enough to explain the concrete phenomenon," given specific circumstances (Yeung, 1997, p. 59).

Methods and Sources

A final consideration is of the specific methods used to produce data. These methods should reflect the ontological priors and epistemological commitments of open development. Here, I offer examples of methods built around networked processes (rather than bounded spaces) that uphold critical realism and cognitive justice, support a reflective approach to intellectual accountability, and are able to produce data that give insights into open development.

Exercises in communication and debate can be a means to uncover patterns of social change. In this type of "constitutive research," all parties involved are asked to engage in reflection and production in the course of the study, and in turn, this impacts their own thinking and engagement, both with each other and beyond. Constitutive research follows a logic similar to open source software production. The effort revolves around a central question, and the source code (or data in this case) is made available to everyone, but each person produces reflections and research results that mirror their personal interests and situated interpretations. This activity is enhanced by discussion, and differences in interpretation create opportunities for debate and can give rise to new central questions. This is different from typical notions of participatory action research in that there does not need to be a particular goal or set process of monitoring and evaluation, and participants need not arrive at consensual results (compare, for example, to Stillman, 2005; or Foth, 2006). Furthermore, action research typically assumes that the work of the researcher will contribute to the goals of the research subjects (Motta, 2009). But in this case, given the emphasis on nonconsensual results, the researcher is released from the obligation to agree with others, and the group can, instead, reflect on the way knowledge is produced within a given context, the implications of this for cognitive justice, and whether and how this helps or hinders the ability of the group to achieve development objectives.

This approach to research is focused on processes of knowledge production, and as such, it might make use of digital platforms such as blogging to collect the interventions of participants. But the work might also take place in the absence of digital platforms. The emphasis here is on cognition, communication, computation, and patterns of openness, not the locations of these. Indeed, as was suggested above, the most revealing activity would actually be to have participants produce knowledge in the ways that most make sense to them, as this would reveal the most about social patterns of relevance to development within a given community.

An example of this approach is "network*ed* evaluation." Recently, Canadian donors and social justice organizations have been calling for new evaluation methodologies for use in social networking projects.[4] Much work is being done to promote networks and networking (Kasper & Scearce, 2008), and this work is thought to have beneficial impacts, but there are no clear methods for evaluating the

4. In particular, in 2007–2008, Toronto's Centre for Social Innovation (CSI) and the Millennium Scholarship Foundation hosted a series of discussions with practitioners about network evaluation. The notions of networked evaluation presented here are mine, but they were nurtured by conversations that took place as a result of this initiative.

creation of networks, the facilitation of network*ing,* or the impacts of either activity. The tendency so far has been to map existing summative evaluation techniques onto networked organizations as a means to satisfy the accountability requirements of government and private donors (see, for example, O'Neil, 2002).[5] But summative evaluation adopts a "cause and effect" logic, and it is often realized from an outsider perspective. Even when participatory, it is done with the goal of producing a consensual discourse, one on which important decisions often depend, such as financing or program objectives. I would argue that these approaches are unlikely to serve their purpose, given that the inherent tendencies of social networks are absorption (e.g., of external shocks or new ideas), dynamism, emergence, and meta-production (of, for example, culture and identity). Any or all of these potentially beneficial outcomes may result from a networking project, even if the project itself is a spectacular failure according to standard measures of summative evaluation. Networked evaluation, which combines empowerment evaluation (Fetterman, 1994; Fetterman, Kaftarian, & Wandersman, 1995) and community technology research (Day, 2005), would form part of the quotidian generative practices of a network. It would be oriented toward uncovering patterns or dynamics, and making sense of them both in and of themselves, and from the differing perspectives of individual participants. Not only is this an approach oriented toward opening up communication rather than pinning down knowledge, but it also recognizes that what may be of little benefit to one person might be massively beneficial to others. All together, then, the approach would contribute to cognitive justice, even as it would work to understand the nature of social and political relations shaping cognitive processes within a given space.

Conclusions

In this article, I have highlighted the difference between ICT4D research that is founded on key assumptions about the information society, and open development research oriented toward ensuring cognitive justice in development processes. I have argued for an approach that focuses on processes of networking and their implications for cognitive justice, regardless of whether technologies are involved or not, over an approach that assumes the parameters and benefits of networks and seeks to promote them through generating greater access to information and knowledge.

I have argued for an alternative approach to research in the field of ICTs and social change, and I have opened grounds for greater debate about the foundations of this field. In particular, research at the intersection of ICTs and development would benefit greatly from additional reflection on the philosophical commitments and assumptions underlying the work. This is a field that often shrugs off serious engagement with larger theoretical or methodological debates, arguing that it is interdisciplinary in nature or oriented toward practice, rendering further reflection unnecessary. But if anything, the pressing and interdisciplinary nature of the work should make us even more determined to reflect on these deeper questions. It should be clear from this article that the ontological foundations of research are intimately linked to policy decisions in the field of international development—decisions that, in turn, have implications for how the world is understood and acted on. In a field so intimately engaged with questions of knowledge and communication, it is imperative for researchers to critically reflect on their own ontological priors and epistemological commitments. These need to be updated to reflect a world opened up by global processes, and in this sense, greater attention needs to be placed on justifying site selection, particularly where research focuses on networks and constitutive processes. Finally, both the study of ICTs and their use in research open up a variety of methodological and ethical questions that should be explored, because they are central to the work of studying and enhancing cognitive justice.

Engaging in research that reflects the elements of research design discussed in this paper is one way of enacting communication societies. In particular, producing better understanding of cognitive justice in developing countries will help both researchers and knowledge producers to better understand the

5. See, for example, the "Philanthropy and Networks Exploration (PNE) Logic Model" by the Packard Foundation (http://www.packard.org/assets/files/capacity%20building%20and%20phil/ organizational%20effectiveness/phil%20networks%20exploration/PNE_logic_model.pdf).

problem of generating spaces in which there is respect for communications rights, democratized knowledge production, and open communication. ■

References

Adler, E. (2002). Constructivism in international relations. In W. Carlsnaes, T. Risse, & B. A. Simmons (Eds.), *Handbook of International Relations.* London: SAGE Publications.

Avgerou, C. (2010). Discourse on ICT and development. *Information Technologies & International Development, 6*(3),1–18.

Baud, M., & Rutten, R. (2004). *Popular intellectuals and social movements: Framing protest in Asia, Africa and Latin America.* New York: Cambridge University Press.

Bebbington, A. (2000). Re-encountering development: Livelihood transitions and place transformations in the Andes. *Annals of the Association of American Geographers, 90*(3), 495–519.

Brett, E. A. (2009). The crisis in development theory. *Reconstructing Development Theory.* Basingstoke, UK: Palgrave Macmillan, 17–33.

Buskens, I. (2011). The importance of intent: Reflecting on open development for women's empowerment. *Information Technologies & International Development, 7*(1), 71–76.

Castells, M. (2006/1999). Information technology, globalisation and social development. Reprinted in A. Gumucio-Dagron and T. Tufte (Eds.), *Communication for social change anthology: Historical and contemporary readings.* South Orange, NJ: CFSC.

Chernoff, F. (2009). The Ontological Fallacy: A rejoinder on the status of scientific realism in international relations. *Review of International Studies, 35,* 371–395.

Coward, C. (2009, March 11). ICT4D, ICTD, or what? *Second Recess.* Retrieved October 30, 2010, from http://chriscoward.wordpress.com/2009/03/11/ict4d-ictd-or-what

Danermark, B., Ekstrom, M., Jakobsen, L., & Karlsson, J. C. (2002). *Explaining society: Critical realism in the social sciences.* New York: Routledge.

Day, P. (2005). Sustainable community technology: The symbiosis between community technology and community research. *The Journal of Community Informatics, 1*(2), 4–13.

de Sousa Santos, B. (2007). Beyond abyssal thinking: From global lines to ecologies of knowledges. *Review, 30*(1), 45–89.

Department for International Development (DFID). (2005). *Monitoring and evaluating information and communication for development (IDC) programs: Guidelines.* DFID, Information and Communication for Development (ICD) Program. Retrieved July 10, 2010, from http://www.dfid.gov.uk/pubs/files/icd-guidelines.pdf

Easterly, W. (2006). *The white man's burden: Why the west's efforts to aid the rest have done so much ill and so little good.* New York: Penguin Press.

Easterly, W. (2010, February 23). *Global poverty has no solution . . . and it's called democracy.* Paul Cadario Visiting Faculty Lecture, Seeley Hall, Trinity College, University of Toronto, Toronto.

Escobar, A. (2007). The 'ontological turn' in social theory. A commentary on 'Human geography without scale,' by S. Marston, J.P. Jones II & K. Woodward. *Transactions of the Institute of British Geographers, 32*(1), 106–111.

Fetterman, D. (1994). Empowerment evaluation. *Evaluation Practice, 15*(1), 1–15.

Fetterman, D., Kaftarian, S. J., & Wandersman, A. (Eds.). (1995). *Empowerment evaluation: Knowledge and tools for self-assessment and accountability.* Thousand Oaks, CA: SAGE Publications.

Foth, M. (2006). Network action research. *Action Research, 4*(2), 205–226.

Freire, P. (2007). *Pedagogy of the oppressed.* New York: Continuum.

George, A., & Bennett, A. (2005). *Case studies and theory development in the social sciences.* Cambridge, MA: MIT Press.

Grix, J. (2002). Introducing students to the generic terminology of social research. *Politics, 22*(3), 175–186.

Gumucio-Dagron, A., & Tufte, T. (2006). Roots and relevance: Introduction to the CFSC Anthology. In A. Gumucio-Dagron & T. Tufte (Eds.), *Communication for social change anthology: Historical and contemporary readings.* South Orange, NJ: CFSC.

Gurstein, M. (2007). *What is community informatics (and why does it matter)?* Monza, Italy: Polimetrica.

Hamelink, C. J. (2002). Social development, information and knowledge: Whatever happened to communication? *Development, 45*(4), 5–9.

Hannerz, U. (2003). Being there . . . and there . . . and there! Reflections on multi-site ethnography. *Ethnography, 4*(2), 201–216.

He, S. (2003). Informatics: A brief survey. *The Electronic Library, 21*(2), 117–122.

Heeks, R. (2006). Theorizing ICT4D research. *Information Technologies & International Development, 3*(3), 1–4.

Henry, L., Mohan, G., & Yanacopulos, H. (2004). Networks as transnational agents of development. *Third World Quarterly, 25*(5), 839–855.

James, J. (2005). The global digital divide in the Internet: Developed countries constructs and Third World realities. *Journal of Information Science, 31*(2), 114–123.

Kabeer, N. (1994). Empowerment from below: Learning from the grassroots. *Reversed Realities: Gender Hierarchies in Development Thought.* London: Verso.

Kaplan, A. (1999). *The development of capacity.* (NGLS Development Dossier.) Geneva: UN Non-Governmental Liaison Service.

Kasper, G., & Scearce, D. (2008). *Working wikily: How networks are changing social change.* Monitor Institute and Packard Foundation. Available at: http://www.packard.org/assets/files/capacity%20building%20and%20phil/organizational%20effectiveness/phil%20networks%20exploration/Working_Wikily_29May08.pdf

Kling, R. (1999, January). What is social informatics and why does it matter? *D-Lib Magazine.* Reprinted in *The Information Society, 23,* 205–220, 2007. Retrieved January 10, 2010, from http://www.dlib.org/dlib/january99/kling/01kling.html

Kling, R. (2000). Social informatics: A new perspective on social research about information and communication technologies. *Prometheus, 18*(3), 245–264.

Kling, R., Rosenbaum, H., & Hert, C. (1998). Social informatics in information science: An introduction. *Journal of the American Society for Information Science, 49*(12), 1,047–1,052.

Kratochwil, F. (2000). Constructing a new orthodoxy? Wendt's 'social theory of international politics,' and the constructivist challenge. *Millennium: Journal of International Studies, 29*(1), 73–101.

Lefebvre, H. (1991). *The production of space.* Oxford/Cambridge, MA: Blackwell.

Lefebvre, H. (1996). *Writings on cities.* Oxford/Cambridge, MA: Blackwell.

Lindlof, T., & Shatzer, M. (1998). Media ethnography in virtual space: Strategies, limits, and possibilities. *Journal of Broadcasting & Electronic Media, 42*(2), 170–189.

MacKenzie, A. (2006). Java™: The practical virtuality of Internet programming. *New Media & Society, 8*(3), 441–465.

Marcus, G. E. (1995). Ethnography in/of the world system: The emergence of multi-sited ethnography. *Annual Review of Anthropology, 24,* 95–117.

Marston, S., Jones II, J. P., & Woodward, K. (2007). The 'ontological turn' in social theory. A commentary on 'human geography without scale.' In A. Escobar (Ed.), *Transactions of the Institute of British Geographers, 32*(1), 106–111.

Molyneux, M. (2001). Ethnography and global processes. *Ethnography, 2*(2), 273–282.

Motta, S. C. (2009). Old tools and new movements in Latin America: Political science as gatekeeper or intellectual illuminator? *Latin American Politics and Society, 51*(5), 31–56.

Nagar, R. (2003). Collaboration across borders: Moving beyond positionality. *Singapore Journal of Tropical Geography, 24*(3), 2–18.

Nanda, M. (2003). Postmodernism, science and religious fundamentalism. Retrieved November 1, 2010, from http://www.butterfliesandwheels.org/2003/postmodernism-science-and-religious-fundamentalism

Nurminen, M. I., Berleur, J., & Impagliazzo, J. (2006). Preface. In J. Berleur, M. I. Nurminen, & J. Impaglizazzo (Eds.), *Social informatics: An information society for all? In remembrance of Rob Kling.* New York: Springer.

Nyamnjoh, F. B. (2006/1996). Africa and the information superhighway: Silent majorities in search of a footpath. Reprinted in A. Gumucio-Dagron & T. Tufte (Eds.), *Communication for social change anthology: Historical and contemporary readings.* South Orange, NJ: CFSC.

O'Neil, D. (2002). Assessing community informatics: A review of methodological approaches for evaluating community networks and community technology centers. *Internet Research, 12*(1), 76.

Parpart, J. (2009, January 9). Exploring the limits of empowerment: Gender, development and violence in an increasingly insecure world. Talk at the *Centre for International Studies Development Seminar Series,* Munk Centre for International Studies, University of Toronto.

Parpart, J., Rai, S., & Staudt, K. (2002). Rethinking em(power)ment, gender and development: An introduction. In J. Parpart, S. Rai, & K. Staudt (Eds.), *Rethinking em(power)ment: Gender and development in a global/local world.* New York: Routledge.

Patomaki, H., & Wight, C. (2000). After postpositivism? The promises of critical realism. *International Studies Quarterly, 44*(2), 213–237.

Pigg, K. E. (2001). Applications of community informatics for building community and enhancing civic society. *Information, Communication & Society, 4*(4), 507–527.

Portugali, J. (2006). Complexity theory as a link between space and place. *Environment and Planning A, 30,* 647–664.

Pouliot, V. (2007). 'Sobjectivism': Toward a constructivist methodology. *International Studies Quarterly, 51*(2), 359–384.

Raiti, G. C. (2006). The lost sheep of ICT4D research. *Information Technologies & International Development, 3*(4),1–7.

Robinson, S. S. (2006/2004). Digital gap or digital inclusion? Reprinted in A. Gumucio-Dagron & T. Tufte (Eds.), *Communication for social change anthology: Historical and contemporary readings.* South Orange, NJ: CFSC.

Rowlands, J. (1997). *Questioning empowerment: Working with women in Honduras.* Oxford: Oxfam Publications.

Santos, B. (2007). Beyond abyssal thinking: From global lines to ecologies of knowledges. *Review,* 30(1), 45–89.

Schuurman, F. J. (1993). Introduction: Development Theory in the 1990s. *Beyond the Impasse: New Directions in Development Theory* (pp. 1–48). London: Zed Books.

Sen, A. (2004). How does culture matter? In V. Rao & M. Walton (Eds.), *Culture and public action.* Palo Alto, CA: Stanford University Press.

Soja, E. (1989). *Postmodern geographies: The reassertion of space in critical social theory.* New York: Verso.

Soja, E. (1996). *Thirdspace: Journeys to Los Angeles and other real-and-imagined places.* Oxford/Cambridge, MA: Blackwell.

Stillman, L. (2005). Participatory action research for electronic community networking projects. *Community Development, 36*(1), 77.

Trouillot, M-R. (1995). *Silencing the past: Power and the production of history.* Boston: Beacon Press.

Unwin, T. (2009). Development agendas and the place of ICTs. *ICT4D: Information and Communication Technologies for Development.* Cambridge: Cambridge University Press.

van der Velden, M. (2005). Programming for cognitive justice: Towards an ethical framework for democratic code. *Interacting with Computers, 17*(1), 105–120.

van der Velden, M. (2006). *A case for cognitive justice.* Monograph. Retrieved from http://www.globalagenda.org/file/24

Visvanathan, S. (2002). The future of science studies. *Futures, 34*(1), 91–101.

Wight, C. (2007). A manifesto for scientific realism in IR: Assuming a can-opener won't work! *Millennium: Journal of International Studies, 35*(2), 379–398.

Wight, C. (2008, March). Theorising international relations: Emergence organised complexity and integrative pluralism. Paper presented at the *International Studies Association Complexity Workshop,* San Francisco.

Yeung, H. W-C. (1997). Critical realism and realist research in human geography: A method or a philosophy in search of a method? *Progress in Human Geography, 21*(1), 51–74.

Research Report

Open Source Biotechnology Platforms for Global Health and Development: Two Case Studies

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Abstract

Using a case study approach, we examine the potential of open source biotechnology platforms for global health and development. Two initiatives relying on collaborative online platforms are analyzed: projects by the nonprofit institute Cambia and India's Open Source Drug Discovery (OSDD) project. Cambia is addressing neglected diseases by making relevant patent information available through both its Patent Lens project and its Initiative for Open Innovation. OSDD complements this initiative through a collaborative platform and open source practices to accelerate drug development for neglected diseases.

Cambia as well as OSDD, while sharing the goal of addressing basic needs of the developing world, have each implemented principles of the open source movement in different ways. We find that, in open source biotechnology for global health and development, at least three linked senses of "open" should be considered: open access, open licensing, and open collaborative platforms. We conclude that biotechnology for global health and development can move ahead through its own version of open source practices and collaborative online platforms.

Introduction

Close to 10 million children under the age of five die each year. Most of these deaths occur in lower-income countries and are preventable (WHO, 2009). Chronic noncommunicable diseases, such as heart disease and cancer, are growing in lower-income countries, and they now account for roughly 60% of all deaths worldwide (Daar, Singer, & Persad, 2007). Yet there is hope for moving forward. Millions of lives have already been saved through vaccinations, public health measures, and drugs (Levine, 2007). Many of these advances can benefit from biotechnology—the use of biological processes for industrial, health, and other purposes.

This article examines the potential of collaborative open source biotechnology platforms in global health and development. We start by summarizing the controversial role of patents in innovation, and by considering the open source approach as one response. We then describe two case studies relying on collaborative online platforms: Cambia and India's Open Source Drug Discovery (OSDD) project. These case studies are based on analyses of transcripts of semistructured interviews conducted by the authors, as well as on secondary data, including journal articles, news reports, books, and Web sites. The next section looks at related initiatives already underway and suggests issues that merit further exploration. We suggest that, in open source biotechnology for global health and

development, at least three linked senses of "open" should be considered: open access, open licensing, and open collaborative platforms.

Finally, we conclude by suggesting what might be needed to build on the modest successes to date. We argue that, supported by collaborative platforms, biotechnology for global health and development holds promise for improving health and food security in developing countries (Masum, Chakma, & Daar, 2011), and that it can move ahead through its own versions of open source practices and collaborative online platforms.

The Controversial Role of Patents in Innovation

Patents are viewed as being directly linked to innovation (Netanel, 2009). However, confounding issues surrounding intellectual property (IP), innovation, and international development have been raised. For patents, these issues include whether patents are being granted for truly novel inventions; when patent protection should be overridden for humanitarian reasons; what barriers to follow-on innovation the patent system might create in itself; and the unique needs of research and development (R&D) for international development (Commission on Intellectual Property Rights, 2002; Netanel, 2009; WHO, 2006). Furthermore, patents themselves can be expensive, time-consuming, and risky to work with.

Innovation rests on a public domain of ideas (Boyle, 2008), yet genes of important organisms like humans, rice, and maize have been patented. Discoveries related to the human genome are vital to future biomedical innovation, but it is estimated that 20% of the human genome is claimed by patents. Two-thirds of these patents are owned by private firms, and a similar fraction may be legally questionable on the grounds that they are too broad, not disclosed properly, or overlap other patent claims (Cukier, 2006). Such "patent thickets" have led to what some experts call the "tragedy of the anticommons"—the proliferation of patents blocking fundamental tools in biotechnology research may have led to the under-use of knowledge, due to high costs and lack of cooperation by patent holders (Gold, Kaplan, Orbinski, Harland-Logan, & N-Marandi, 2010; Maurer, 2006), though the extent to which this actually takes place is debated (Joly, 2007).

Patent pools are consortiums that agree to cross-license patents relating to a particular technology. They are beginning to be used to stimulate research in neglected diseases, allowing both access to select technologies and competitive business practices (Van Overwalle, 2009). However, more enabling tools and collaborative practices are required to harness innovation and the patent landscape for international development.

The Open Source Approach

The open source movement has had an enormous impact on the global software industry (St. Amant & Still, 2007), with estimates of an economic value in the tens of billions of dollars. However, this economic impact understates open source's true importance. Richard Stallman emphasizes the value of software that is both open and *free*—in his phrase, "free as in 'free speech,' not free as in 'free beer'" (Williams, 2002). Free and open software, as Stallman defines it, is software that not only is not proprietary, but that cannot be made proprietary—access to it is an inalienable right, regardless of location or income, and other software can build on it to create new solutions.

A range of incentives motivate participation in open source projects, including building reputation, providing public goods, and undercutting for-profit rivals (Weber, 2004). Open source methods are now being applied in different sectors, including biotechnology. However, the metaphor of open source needs adaptation when transferred to biotechnology, since biotechnology research efforts are not structured like the software industry. To take one difference, new biotechnology may require long and expensive laboratory development, followed by even more expensive clinical trials. New software, on the other hand, can be developed in a more incremental and, typically, less expensive fashion.

In the remainder of this article, we explore the Cambia and OSDD initiatives, and we discuss how open source approaches are being applied in biotechnology for global health and development, supported by collaborative online platforms.

Case 1: Cambia

Cambia is a private, nonprofit institute based in Australia. Founded by Richard Jefferson, Cambia's mission is "to democratize innovation: to create a more equitable and inclusive capability to solve problems using science and technology" (Cambia, 2011).

Cambia used its first grants from the Rockefeller Foundation to develop training and technology to support rice scientists in Asia, Africa, and Latin America. During the 1990s, Jefferson traveled to many labs doing biotechnology in the developing world; this experience influenced his later work.

BiOS: An Open Source Licensing Solution for Biotech

In 2006, Cambia launched the BiOS Initiative (Biological Innovation for Open Society), the aim of which was to create a "protected commons" to allow users to access, improve, and modify enabling technologies without infringing on proprietary rights. According to Gary Toenniessen, director of food security at the Rockefeller Foundation, "agriculture R&D for the developing world could be lost without a concept like BiOS and open source" (Miller, 2004).

The heart of the BiOS Initiative is the development of BiOS licenses, designed to cultivate collaboration. BiOS licenses derive from Jefferson's belief in the enabling power of legal tools. They aim to allow access to, and improvement of, enabling technologies, which in turn are hoped to ease the development of solutions for local needs. BiOS follows a long line of previous open licenses like the GPL (software) and Creative Commons (cultural goods) that have "some rights reserved" (Boyle, 2008).

BiOS licensees must sign a detailed legal contract to preserve the right of others to use the technology—e.g., by agreeing not to assert IP rights against others who have also signed the contract. In exchange, they gain access to the technology (BiOS, 2009). Unlike some other open source licenses, BiOS licenses do not prohibit licensed technology from being used to develop downstream proprietary products.

When a developer makes technology available under a BiOS license, the developer does retain ownership of the technology, but the company may not assert IP rights over that technology or improvements against other BiOS licensees, nor may it prevent sharing of biosafety data. There is a technology support agreement with each BiOS license in which for-profit companies must pay a fee based on their location and size of operations.

Cambia's first license was developed for plant molecular-enabling technologies, with subsequent licenses including one for health-related technologies, as well as a generic agreement for patented technologies and know-how. Cambia's Web site sums up the potential benefits of the BiOS licenses as follows (BiOS, 2009):

- Ability to access the intelligence, creativity, goodwill, and testing facilities of a larger and wider community of researchers and innovators;
- Decreased transaction costs relative to out-licensing or obtaining technology via bilateral license agreements;
- Potential for portfolio growth through synergies obtained by combining pieces of technology that may, by themselves, be too small to make a profit or lack sufficient freedom to operate or implement;
- High leverage of costly investments in obtaining proofs of concept, developing improvements, and obtaining regulatory and utility data; and
- Ability to commercialize products without an additional royalty burden.

Cambia suggests that BiOS licenses may be of interest to several groups: first, anyone interested in materials and technology from Cambia itself, such as GUSPlus or TransBacter, which are available only under BiOS-compatible agreements; second, research organizations that want access to helpful information; third, smaller enterprises that want protection from the "patent thickets" described earlier that impede their progress; and fourth, large companies that see how sharing information in particular domains may help them leverage investment by selling services and building on the improvements of others (as has happened with some large companies in the software industry, like IBM).

Some conclusions can be drawn from Cambia's experience with BiOS. Various firms did express enthusiasm toward the BiOS licensing structure during the first years of the initiative. However, the licenses still need to be worked on to have the effect that Cambia desires. Certainly, BiOS has not resulted in a flowering of open projects in the way that the GNU Public License and its offspring produced in software.

The primary reason for this may be that software is intrinsically cheap to produce. One programmer working in her basement may create a new product,

requiring none of the sophisticated laboratory equipment on which biotechnology depends. Software does not require large investments to meet regulatory and clinical testing requirements. Once created, software is easy to reproduce.

While large or mid-sized organizations will have the resources to pursue Cambia's licensing scheme, small organizations may not. Another problem is that in order to create a pool of components large enough to create new solutions, many distinct methods may need to be licensed.

An analysis of BiOS suggests that IP managers committed to open access might still benefit from the strategic use of patents in certain cases, such as to meet humanitarian goals (Boettiger & Wright, 2006). For example, by facilitating sales in developed country markets, funding might more easily be found to increase product availability in developing countries. Effective use of licenses like BiOS may depend on a clear understanding of goals, power structures, and the IP landscape.

BioForge: The First Open Biotech Web Portal

Launched by Cambia in 2005, BioForge was a Web portal designed to create an active development community that would collaborate on projects and technologies, develop protocols, discuss experiences, and access tools in a public but secure environment. BioForge was patterned on successful software development portals such as SourceForge.

To kick-start BioForge in 2005, Jefferson seeded it with patented Cambia technologies, including GUSPlus. Within two months of its launch, BioForge had 2,000 registered users. What was expected from BioForge was a cooperative development of concepts and solutions.

However, within the first year of BioForge's launch, it became clear that collaborating online was not happening within the target life sciences community. BioForge did not continue to grow.

Several factors may have contributed. Scientists may not be motivated to collaborate online unless it helps to solve immediate challenges. Similarly, Janet Hope has suggested that collaboration between biotech workers may be harder than in software, because of a lack of standardization (Hope, 2008). She gives the example of experimental protocols, which may differ from lab to lab. It is not clear that a portal like BioForge could facilitate the sharing of lab culture. Finally, as Jefferson has said, "Now can we do [BioForge] differently? Absolutely. . . . [When] a sensible accreditation and value is ascribed to a contribution, then it'll have merit. It really will" (Personal communication, 2009).

The BioForge project did not thrive, and it was discontinued. A follow-up platform that learns from BioForge's difficulties may yet prove valuable.

Patent Lens: An Open Patent Research System

Large costs in navigating "patent thickets" risk hampering follow-on innovation, and some argue that patents have been granted for innovations of dubious novelty (Heller, 2008). Patent Lens, a free patent informatics resource, is Cambia's response to this complexity. As of 2009, the database contained more than nine million patents, and over 68 million DNA and protein sequences disclosed in patents.

Patent Lens allows diverse players to investigate and analyze key IP issues, facilitating community involvement in guiding the patent system. Cambia plans to integrate business information into the database to make visible IP power chains aimed to reveal who owns what, and dependencies between technologies. According to Jefferson:

> Patents are not about science—they're about the conversion of science into perceived economic value, and that specialized language and capability has emerged as the ecclesiastical elite. What we wish to do is democratize that process. (Personal communication, 2009)

Patent Lens was first developed with funding from the Rockefeller Foundation, which saw that industrialized countries were seeking patents on the rice genome. These patents could inhibit the improvement of rice in the developing world. Early on, Cambia's team used the Patent Lens technology to map out the patent landscape of *Agrobacterium*—a widely-used tool for making transgenic plants, tied up in many patents mainly owned by a few large life sciences companies. Cambia was then able to develop TransBacter, a way to implant genes into a plant using a different family of bacteria than that used by *Agrobacterium*.

Patent Lens has been praised by the World Intellectual Property Organization (WIPO) and commentators. The next step Jefferson sees is to develop informatics for analyzing patents, as discussed later in the Initiative for Open Innovation section.

With an understanding of Cambia's history and projects, we turn now to the second case study in collaborative open source biotechnology platforms.

Case 2: OSDD (Open Source Drug Discovery)

India's OSDD consortium was launched in 2007 by the country's Council of Scientific and Industrial Research (CSIR). OSDD has been strongly supported by CSIR's director, Samir Brahmachari.

The OSDD initiative attempts to encompass the drug discovery process: identification of nontoxic drug targets, *in vitro* and *in vivo* validation, *in silico* screening of small molecules, lead optimization, preclinical toxicity, and clinical trials. OSDD aims to achieve affordable health care through a platform where talented minds can collectively discover novel therapies, as well as to bring openness and collaboration to the drug discovery process, and keep drug costs low.

Brahmachari has suggested the necessity of retaining patent protection alongside open source development, rather than in opposition to it:

> We will not put a wall around drugs that are required by the masses and which we want to sell cheaply (such as Hepatitis or TB drugs), but will put a wall around drugs that have high market affordability, where the diseases that these drugs treat are not yet prevalent among lower income groups. In addition, by patenting, we can also challenge monopolies. (Kochupillai, 2008)

For Brahmachari and OSDD, openness represents an instrument—one that, like patent law itself, is to be used appropriately to achieve specific goals and social results.

How OSDD Works

Developments in bioinformatics have enabled researchers to do some drug discovery *in silico,* while sitting in front of their computers. CSIR has set up a collaborative online platform, SysBorgTb, focused on tuberculosis. The Web portal provides bioinformatics tools, biological information, data on the pathogens, projects for participation in drug discovery, and discussion forums. As of October 2009, there were more than 1,700 registered participants for OSDD (SysBorgTb, 2009).

OSDD aims to break down drug discovery into smaller activities with clear deliverables, which are posted on its Web portal. Participants can contribute ideas, software, articles, IP, or anything else that helps to solve these problems.

Users of the portal must comply with OSDD's terms and conditions, which aim to prevent third parties from acquiring proprietary rights based on information available on the portal without contributing improvements made back to OSDD. Like the BiOS license, OSDD allows users to commercially or noncommercially use improvements, additions, or modifications. Users, though, must grant back an unencumbered worldwide non-exclusive right to OSDD for use of any IP rights acquired for their improvements or modifications.

Participants have clear incentives—an element that Jefferson identified as missing from BioForge. All contributions are planned to be peer-reviewed; contributors will receive rights within the system based on credits accrued. A more subtle incentive may come from OSDD's momentum: clear goals and high-profile backers.

The OSDD project has investigated the genetics of *Mycobacterium tuberculosis,* with a view to finding new treatments. In October 2009, OSDD announced a collaborative project to re-annotate the entire *Mycobacterium tuberculosis* genome in order to make all information available on each gene easily accessible and searchable. While the success of this project remains to be assessed, it follows the earlier successful completion by OSDD of "TBrowse," an analysis tool for the tuberculosis genome (Bhardwaj, Bhartiya, Kumar, et al., 2009). The complexity of developing better tuberculosis treatments highlights the need for the best minds to collaborate and share expertise in an open environment.

Scarecrow or Wall: Using the Right Form of Protection

Samir Brahmachari's approach to open source is to add it to the toolkit next to patent protection. Brahmachari likens the difference between the two approaches to the difference in protecting a factory (by erecting an expensive wall) as opposed to protecting a rice paddy (by erecting a cheap scarecrow):

> In growing a paddy, we will use an open source model. While building a factory, we will patent. If my discovery benefits millions, and I want to give it to them cheaply, I do not want to raise the costs by spending a lot of money in protecting.

> But if the R&D is highly expensive, then we will patent. (Personal communication, 2009)

Brahmachari sees open source as a methodology that can be used for sidestepping certain issues, rather than meeting them head-on. For instance, by developing free diagnostics based on pharmacogenomic principles, an open source initiative can revive older, inexpensive drugs, thus sidestepping the arduous process of developing new drugs.

Looking Ahead

The Initiative for Open Innovation

Cambia's Patent Lens project was a significant success, and it is now an open Web resource for patent search and analysis. The BiOS licensing infrastructure was met with enthusiasm by some organizations, but it had problems in becoming truly effective in its goals. BioForge did not complement the culture of scientists, and this first attempt at a collaborative portal for biotech was not successful.

With these lessons learned, Cambia is moving ahead with the new Initiative for Open Innovation (IOI). IOI will explore and validate new collaboration and licensing tools with the aim of fostering a "commons of capability." This commons is hoped to lower costs of creating new biotechnology solutions by helping nonspecialists identify areas of opportunity.

As of 2010, IOI was being funded by the Bill and Melinda Gates Foundation and the Lemelson Foundation. The initial funding of AU$5 million was focused on creating "patent landscapes" for malaria, tuberculosis, dengue, and other critical infectious diseases of the developing world.

IOI aims to create an evidence base for policy changes for public benefit. Jefferson describes how these tools will help to reduce barriers to innovation by reducing the need for expensive IP professionals or "clergy":

> What we're trying to do with this, in terms of the low hanging fruit, is to bring in the world's patent information in a form that lends itself to much higher order mark-up and navigation tools. . . . How does it affect your life as a drug developer? Or as a citizen? There's no way to know that right now except through clergy interventions and our job is to break that down. (Personal communication, 2009)

IOI has plans to partner with the Indian government and OSDD. OSDD may benefit both from Cambia's philosophy on system-level barriers, and from its IT tools to navigate patents.

Four Issues for Future Exploration

The case studies in this article indicate the potential and modest achievements to date of collaborative platforms and open source methods for development-oriented biotechnology. Many issues remain to be explored.

Viable collaborative platforms: Cambia and OSDD both deployed collaborative platforms. While BioForge was not a success, OSDD and Patent Lens suggest the potential of open platforms.

Success factors included low cost of entry for participants and subdivision of complex challenges into simpler sub-challenges (Benkler, 2006). Institutional support, strong leading personalities, and a humanitarian mission encouraged volunteering. As Jefferson and OSDD noted, metrics that reward users' contributions may be helpful. Other factors include interface design and the platform's perceived utility for helping users solve the problems they care about.

Three kinds of "open": The demonstrated value of collaborative platforms in both Cambia and OSDD illustrates a point about the "open source" nomenclature. In the software world, open source literally refers to the ability to see the source code of programs. However, "open source" also embodies a set of cultural practices, licenses, and innovative collaboration methods.

In development-oriented life sciences, therefore, at least three linked senses of open source should be considered: open access to underlying information, open licensing practices, and open collaborative methods and platforms. Open access to information by itself, while often the easiest step to take, may be of little value without the freedom and collaborators with which to apply such information to create solutions.

The IP reform debate: Many calls for reform have been raised in IP and international development (Netanel, 2009; WHO, 2006). While global health issues have featured prominently in these debates, such as compulsory licenses to permit lower-cost manufacturing of essential medicines, the use of collaborative platforms and open source for global health has, thus far, received little attention.

Part of the reason may be the complexity of the issues involved. It is easy to understand a situation where a Brazilian, South African, or Indian company wishes to manufacture a low-cost version of an AIDS drug. It is much harder to grasp the opportunity costs of a complex patent regime, the unrealized potential of drugs that are *not* being developed when barriers to innovation are high, or the potential inhibiting effect on innovation of relaxing IP protection. Tools like Patent Lens help to demystify such issues.

To enable a more informed debate, it may help to look at examples such as Cambia and OSDD. Better metrics and tools might also be created to analyze IP policy options.

Incentives for innovation: A key issue raised by private sector entities in favor of stricter IP regimes is incentives for innovation. If innovators are not rewarded, who will invest in innovation?

There is a need to better understand viable business models addressing this issue. For example, Hope (2008) has proposed that a biotech company could remain profitable while open-sourcing its core technology. Her model assumes the following to be true: increased access to a product or method will increase its adoption and customer base; wide adoption may lead to improvements in the product or technology; and the company can position itself to profit through analysis and contract research, and to act as the "expert" in the open-sourced technology. This model is analogous to one that has been successful for companies like Red Hat in the software world: Red Hat's original business model was to give away its core Linux operating system for free, and then to charge for premium support services.

While intriguing, more analysis is needed. Biotechnology innovations may be the result of a complex chain of discoveries, each of which entails risky investments that may fail. At which of these stages are open source approaches most viable? What partial rights regimes might release humanitarian rights that promote use in low-income countries, while keeping core rights that a company needs to maintain profitability (akin to the BiOS and Creative Commons "some rights reserved" approach)? How can investments into enabling collaborative platforms be supported as pre-competitive tools that help all parties achieve more?

Both Cambia and OSDD were largely supported through government and foundation grants. However, a variety of innovative funding mechanisms are being explored for global health that span the spectrum from for-profit to grant-based (Hecht, Wilson, & Palriwala, 2009). There is ample room for research into viable open source models that apply at each stage of the biotechnology value chain.

With research into diseases of the poor receiving increasing funding, there may be more receptiveness to the argument that open source approaches can increase the pool of knowledge capital on which downstream innovations will be based, even though they may make private capture of short-term profits more difficult in some cases. Future initiatives may need incentives to attract sufficient early adopters for the innovation or platform to become self-sustaining, and metrics to measure forms of output that add to the global knowledge commons may also be necessary.

Conclusion

In this article, we have explored two case studies of collaborative open source biotechnology platforms, and considered implications for new solutions for international development.

Each area of endeavor that open source principles are applied to may require adaptation. Attempts at mapping collaborative platforms and the software analogy onto such areas (for instance, BioForge as an explicit copy of SourceForge) may fail. However, they may fail in an educational way, indicating which alternative way forward may succeed. For example, the Tropical Disease Initiative is trying open source methods for neglected disease research and drug discovery (Maurer, Rai, & Sali, 2004), attempting to kick-start participation with publication of a small base of seed work (Orti et al., 2009), though with limited success to date.

The fact that organizations like India's OSDD are pursuing collaborative platforms for open source drug development is indicative of the potential in the developing world. While OSDD is at a very early stage, it has attracted thousands of contributors and received major funding from the Indian government. Initiatives like OSDD may enable North-South collaborations to tackle international development challenges.

"Open source" can entail open access to information, open licensing practices, and open collaborative platforms. A project may gain differential

benefits from different ways of being "open." One universal principle, suggested by Richard Jefferson and others—*a right of access to enabling technologies*—may be more important than the details of a particular license. With this principle and the observations above in mind, the need now is for further research and implementation to harness open source and collaborative approaches for solving challenges in international development. ■

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References

Benkler, Y. (2006). *The wealth of networks: How social production transforms markets and freedom.* New Haven, CT: Yale University Press.

Bhardwaj, A., Bhartiya, D., Kumar, N., Open Source Drug Discovery Consortium, & Scaria, V. (2009). TBrowse: An integrative genomics map of Mycobacterium tuberculosis. *Tuberculosis, 89*(5), 386–387.

Biological Innovation for Open Society (BiOS) License. (2009). Retrieved December 19, 2009, from http://www.bios.net/daisy/bios/mta/agreement-patented.html. Archived by WebCite® at http://www.webcitation.org/5m89ua1iz

Boettiger, S., & Wright, B. D. (2006). Open source in biotechnology: Open questions (Innovations case discussion: CAMBIA-BiOS). *Innovations Journal, 1*(4), 45–57.

Boyle, J. (2008). *The public domain: Enclosing the commons of the mind.* New Haven, CT: Yale University Press.

Cambia, *Cambia's Mission and Ethos.* (2011). Retrieved January 13, 2011, from http://www.cambia.org/daisy/cambia/about/590.html

Commission on Intellectual Property Rights. (2002). *Integrating intellectual property rights and development policy: Report of the Commission on Intellectual Property Rights.* London: Commission on Intellectual Property Rights, UK Department for International Development.

Cukier, K. N. (2006). Navigating the future(s) of biotech intellectual property. *Nature Biotechnology, 24,* 249–251.

Daar, A. S., Singer, P. A., & Persad, D. L., et al. (2007). Grand challenges in chronic non-communicable diseases. *Nature, 450,* 494–496.

Gold, E. R., Kaplan, W., Orbinski, J., Harland-Logan, S., & N-Marandi, S. (2010). Are patents impeding medical care and innovation? *PLoS Medicine 7*(1), e1000208. doi:10.1371/journal.pmed.1000208.

Hecht, R., Wilson, P., & Palriwala, A. (2009). Improving health R&D financing for developing countries: A menu of innovative policy options. *Health Affairs, 28*(4), 974–985.

Heller, M. (2008). *The gridlock economy: How too much ownership wrecks markets, stops innovation, and costs lives.* New York: Basic Books.

Hope, J. (2008). *Biobazaar: The open source revolution and biotechnology.* Cambridge, MA: Harvard University Press.

Joly, Y. (2007). Open source approaches in biotechnology: Utopia revisited. *Maine Law Review, 59*(2).

Kochupillai, M. (2008). Spicy IP interview, March 19, 2008. Retrieved October 29, 2009, from http://spicyipindia.blogspot.com/2008/03/spicy-ip-interview-with-dr-samir-k.html. Archived by WebCite® at http://www.webcitation.org/5kthTApwL.

Levine, R. (2007). *Case studies in global health: Millions saved.* Sudbury, MA: Jones and Bartlett Publishers.

Masum, H., Chakma, J., & Daar, A. S. (2011). Biotechnology and global health. In *Global health and global health ethics.* Cambridge, UK: Cambridge University Press.

Maurer, S. M., Rai, A., & Sali, A. (2004). Finding cures for tropical diseases: Is open source an answer? *PLoS Medicine 1*(3), e56. doi:10.1371/journal.pmed.0010056.

Maurer, S. M. (2006). Inside the anticommons: Academic scientists' struggle to build a commercially self-supporting human mutations database, 1999–2001. *Research Policy, 35*(6), 839–853.

Miller, K. L. (2004, November 29). Juggling two worlds. *Newsweek International,* p. 56.

Netanel, N. W. (Ed.). (2009). *The development agenda: Global intellectual property and developing countries.* Oxford & New York: Oxford University Press.

Orti, L., Carbajo, R. J., & Pieper, U. (2009). A kernel for open source drug discovery in tropical diseases. *PLoS Neglected Tropical Diseases, 3*(4), e418. doi:10.1371/journal.pntd.

St. Amant, K., & Still, B. (Eds.). (2007). *Handbook of research on open source software: Technological, economic, and social perspectives.* Hershey, PA: Information Science Reference.

SysBorgTB. (2009). Retrieved October 29, 2009, from http://sysborgtb.osdd.net. Archived by WebCite® at http://www.webcitation.org/5ktl4LOQW

Van Overwalle, G. (Ed.). (2009). *Gene patents and collaborative licensing models: Patent pools, clearinghouses, open source models and liability regimes.* Cambridge, UK: Cambridge University Press.

Weber, S. (2004). *The success of open source.* Cambridge, MA: Harvard University Press.

Williams, S. (2002). *Free as in freedom: Richard Stallman's crusade for free software.* Sebastopol, CA: O'Reilly.

Willinsky, J. (2006). *The access principle: The case for open access to research and scholarship.* Cambridge, MA: MIT Press.

World Health Organization (WHO) Commission on Intellectual Property Rights, Innovation and Public Health. (2006). *Public health, innovation and intellectual property rights: Report of the Commission on Intellectual Property Rights, Innovation and Public Health.* Geneva: WHO Press.

World Health Organization (WHO). (2009). *Global health risks: Mortality and burden of disease attributable to selected major risks.* Geneva: WHO Press.

Forum

The Importance of Intent: Reflecting on Open Development for Women's Empowerment

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Introduction[1]

In their article, "Open ICT Ecosystems Transforming the Developing World," Matthew L. Smith and Laurent Elder (2010) pose the hypothesis that open social arrangements, enabled by ICTs, can help to catalyze the development impacts of ICTs. An ICT ecosystem is understood to be a social system within which ICTs are embedded, and an open social arrangement consists of social relationships that favor:

(a) Universal over restricted access;

(b) Universal over restricted participation in informal and formal groups or institutions; and

(c) Collaborative over centralized production.

"In other words, open ICT ecosystems provide the space for the amplification and transformation of social activities that can be powerful drivers of development" (Smith & Elder, 2010, pp. 65–66).

I subscribe to the idea that more sharing, connecting, and collaborating among people in free, unbound, and uncontrolled ways through the use of ICTs will have developmental benefits because of the acceleration of learning opportunities that such openness provides. The open development hypothesis suggests that positive development ends can emerge through new models of engagement and innovation that are more participatory, collaborative, and driven by the beneficiaries (Elder, Emdon, Petrazzini, & Smith, 2011).

My hesitation to embrace these perspectives on open development without reservation comes from two concerns, which are related. The first is that open ICT ecosystems do not exist in a power vacuum; neither does our (nor anybody else's) thinking about open development. The practice of naming phenomena and assigning meaning to them from an "outsider perspective" without taking the "insider perspective" into the conceptual equation has to be problematized as an act of power, especially in the context of human development and women's empowerment.

My second concern is the conceptual neglect of human intent in the efforts to understand human initiatives in general, and in this context of open development in particular. Moddel (2009) frames intent as "the impetus to form meaning or to perform a specific act."

He asserts that while "intent" is:

> ignored in classical science and without a place in cybernetic emitter/receptor descriptions of communication, the ubiquity of intent has been

1. The author wishes to express her sincere appreciation for the reviewers' comments and suggestions; they prompted further reflection and critical analysis of my thinking.

> left unacknowledged and yet without it no unit of meaning would enter our minds and we would be zombies in a world totally out of reach. (ibid.)

It can be argued that the motivation for the emergence of certain measures and aspects can be framed as open development have come from a human intent which has nothing to do with openness or open development. For instance, a university's decision to open up its academics' publications through unrestricted Web publishing probably originates from a desire to position itself well—which, in turn, will benefit its academics. To categorize such initiatives as "openness" is thus an act of giving meaning from an outsider perspective while neglecting the insider intent that instigated the initiative. This is problematic for two reasons. Neglecting "insider intent" makes part of the rationality of the initiatives invisible. This, then, represents a missed opportunity in furthering an understanding of human behavior, which is particularly regrettable from a policy development perspective. Furthermore, the nexus between power and knowledge construction has to be taken into account here, also: "Outsider conceptualizations" would not interfere with the university's intent for their so-called "openness" initiatives. Even when the respective actors would describe their own measures and behaviors as "open"—perhaps to make themselves and their actions recognizable to significant outsiders, the original intent that sparked their actions would not be lost. But when there is a power differential between the ones "giving meaning" and the ones "whose measures and behaviors are given meaning to," the potential impact of outsider perspective on insider intent has to be problematized. While this would be relevant in any situation of power differentials, in situations where women are involved, it is pivotal.

Our experiences in GRACE (Gender Research in Africa and Arab Countries into ICTs for Empowerment [grace-network.net]) have shown that power dynamics in the environment may corrupt "the quality of openness" of open ICT ecosystems, despite the intentions of stakeholders and role players. There is even the real danger that an open ICT ecosystem could exacerbate existing gender injustices and inequalities. When openness translates itself into gender-blindness—and thus, power-blindness—openness can become a threat not only to women's empowerment, but also to the project of open development itself. The nature of social reality is gendered, and the power dynamics that create and maintain the inequities between women and men pervade human thinking, being, knowing, and relating. Implementing ICT programs without gender awareness will reinforce this inequality. While Sutton and Pollock speak to the Canadian situation, their insight might be even more pertinent for the developing world:

> Distributing ICT without looking at inequality is a way to reinforce that inequality. ICT has such potential to empower its users that this uneven distribution of resources to get connected is very likely to increase inequality and to embed itself in the future. (2004, p. 704)

Understanding the nature of the threat of (gender) power dynamics to the dream of openness does, however, also point to a possible solution: Openly acknowledging and empowering the "insider" intent that can give rise to and maintain the so called "openness measures" will enable practitioners, researchers, and policy makers to support this intent, thus keeping the dream of openness that these measures represent alive and preventing them from becoming corrupted in and through the (gendered) environments in which they exist and acquire their meanings.

To illustrate this, I would like to share some of the insights gleaned from the research and management experiences within the GRACE network that speak to the three aspects that Smith and Elder (2010) suggest for their definition of openness in open ICT ecosystems: access, participation, and collaborative production.

Case 1: Restricted Access Because of an Open-Access Rule

The Library Computers at the University of Zimbabwe in Harare

At the University of Zimbabwe in Harare, access to the free library computers was governed on the basis of the rule of first-come, first-served. However, the librarians noticed that the overwhelming majority of the students using the computers were male. When asked about their perspectives and experiences around access, the female students spoke about their duties as wives and mothers at home—

which they had to fulfil exactly during the time at which the computers were free—and about the fact that, when they lined up, they ran the risk of being pushed out of the line by the male students. While they acknowledged the first-come, first-served rule as democratic, fair, and even empowering, at the same time, they lamented that they had to put in extra effort to gain access to computers in other ways. These female students did not have a concept—a way of thinking about this access rule that really matched their experience of this rule—just the lived reality that was a consequence of this rule. When the researchers subsequently deepened their research efforts and created opportunities for these women to face their experiences, emotions, reflections, and dreams, these female students were able to bring more coherence to their thinking, and to acknowledge their lack of access as inconvenient and disempowering. Without the researchers' interventions, the female students would not have been able to do the conceptual work that gave them a position from which to question the fairness of this rule (Mbambo-Thata, Mlambo, & Mwatsyia, 2009).

The first-come, first-served rule, which was undoubtedly established by the university management with the intent to guarantee as much "universal access" to both genders as possible, became a tool of gender discrimination in a patriarchal environment. Even more problematic was the fact that the rule itself had become a corruptive force: It provided a "logical" frame for the students' experiences and thus functioned as a conceptual smokescreen, making it more difficult for them to realize what was really going on. As such, the first-come, first-served rule was very effective in removing female competition from the computer access arena. It also kept in place the stereotypes about women and their non-use of ICTs.

The Zimbabwe case study shows how the social and individual gender dimensions create and maintain each other through the dynamic of disempowered people accepting the concepts of the powerful to give meaning to their experiences. Women may not even be aware of the ways in which they are agents of their own disempowerment—not only because of the way they give meaning to their experiences in patriarchal environments, but because they may give up their alignment with their own intent in the face of outside pressure without being totally aware of this. It is a fact well known to feminist researchers "that the viewpoint of the dominant groups, which permeates the common knowledge of how society should function, has obscured the true interests of other groups" (Hill, p. 130).

Case 2: Restricted Participation Because of the Open Market Mechanism

The Use of Mobiles for Social Advocacy in Zambia

The use of mobile phones enhances the possibility for connection, mobilization, and social advocacy, especially in environments where, due to lack of landlines, human messengers and face-to-face contact have to do much of this work. In such a context, the innovative use of mobiles, such as paging through missed calls, seems to make more participation possible for people who cannot afford to use a mobile because of the prohibitive costs of mobile telephony. However, Abraham (2009) found in his research "The names in your address book: Are mobile phone networks effective in advocating women's rights in Zambia?" that it was exactly this innovative use of exercising the missed calls option of mobile phone use that created a divisive effect within a group of women using their phones for the explicit purposes of connection, mobilization, and social advocacy. The women users started speaking of "callers" and "beepers," and a "virtual class system" was created (Abraham, 2009, p. 102). Because the use of ICTs takes place within a monetary system that is divisive, ICTs can become the handmaidens of this system, and ICT users can perpetuate these divisive dynamics (Gurumurthy, 2010, p. 60). In this case, where the purpose of the mobile phone use was connection, mobilization, and advocacy, this divisive aspect of mobile phone use is more than ironic; it is painful and jarring. When this insight is juxtaposed against the fact that the majority of the poor are women, and that women, more than men, would take care of immediate household needs before buying air time, the restrictions to participation that are caused by mobile phone costs should not be underestimated (Comfort & Dada, pp. 44–45).

In Zambia, the women's organizations' motivation to enhance the effectiveness of their connection and make their participation more inclusive

through the use of mobile phones was thwarted through the monetary aspects of the financial economic environment that, ironically enough, is called a free market or open market system.

Case 3: Collaborative and Decentralized Production in and Through an ICT Gender Research Network: The Rhythms of Openings and Closures in GRACE

GRACE, an IDRC-funded collaborative ICT gender research network, has produced its first book, and it is in the process of developing a second book, with many researchers having done individual presentations, book launches, interviews, and consultations (grace-network.net). The original network was comprised of 14 teams in 12 countries in 2005, and it was expanded in 2008 to 22 teams in 17 countries. Across the continent, policy makers are paying attention to the findings, and the book attracts attention internationally because of the way in which innovative research and capacity-building methodology are combined within a research network approach.

At the July 2005 inception workshop, the initial Africa group set out the following values for the network as an expression of how they wanted to experience themselves and each other in order to accomplish what they desired to do: "Discovery, Warm Space, Exploration, Sharing, Empowerment, Learning, Innovation, Voice (giving), Transformation, Change, Interaction, Team Work, Visual Space, Hard Work, Challenging, Direction, Wish, Adventure, Growth, Reflection, Network, Friendship, Social Change, Relaxation" (internal project documentation).

No mention was made of openness as a value amid these 26 others. However, from a network management perspective, openness was understood as an important strategy for stimulating research competence and enhanced group learning: The network members would need to open up and feel free to share, so that they could give and receive support from each other and produce the research findings that their countries needed. The following quotation from one of the network members illustrates this:

> Since the first meetings, I realized that I was discovering a beautiful family, marked by the opening to each other, friendliness, complicity, respect, I realized that GRACE is a space of discussion, exchange of information, sharing of knowledge, know-how, soft skills.

Since this first workshop in July 2005, a shared understanding about the purpose and scope of the network has emerged through ongoing debate and questioning. Openness was embraced as a strategy, as a means to the ends of research collaboration and research capacity development: In order to do their often path-breaking gender research in their respective countries, the GRACE researchers needed a safe space to grow and connect with each other. This referred to the female as well as the male researchers, although their challenges were different. One of the main drivers in the network was, therefore, trust. Trust in oneself grew through expanding research competence and gender awareness that brought with it a growing confidence in one's own position within one's own social environments. Trust in one another within the network grew through allowing and appreciating the diversity in theoretical, methodological, gender, and spiritual perspectives that stimulated growth on an individual and group level.

Yet even within this network space, open sharing between the researchers had to be mediated by their need for safety. Women are being killed for being known to be feminist in this world, for speaking up for their own and other women's human rights. GRACE researchers are never only GRACE researchers—they play a lot of other roles, and they are members of many social systems in their countries of origin, as well as regionally and internationally. These forums are very diverse, and not all share enlightened perspectives on women's empowerment and gender equality. The GRACE social platforms were therefore managed through a rhythm of openings and closures: Research questions that were politically sensitive were not immediately shared with all members of the network, and some of the dialogues among the researchers were conducted via special research mailing lists and not the general GRACE list, to which non-GRACE members had access.

Conceptualization and Coherence

While the power vested in systems of patriarchal and financial control should not be underestimated,

it can be argued that the actors' conceptualizations collaborated with, and contributed to, the corruption of the dreams of openness that seemed embedded in the open ICT ecosystems.

Conceptualizing the unequal access to the library computers in Zimbabwe as fair and empowering would have been "caused" by the democratic connotations attached to the first-come, first-served rule. The students' acceptance of these connotations in their processes of giving meaning to their experiences created a "smokescreen" that prevented them from coming to a clear analysis of the actual outcomes of the open-access rule. In the face of the actual divisive effects, conceptualizing mobile phone use as effective as regards connection would have been "caused" by the connotations of connection attached to mobile phone use.

At the same time, in both of these cases, the dream that was part of, and inspired the measures and practices of, openness and which had become implicit—and therefore, difficult to discuss—was made visible again exactly because it was lost. The lack of coherence between the "promise" that the open ICT ecosystems held, the "official" meaning that was given to these measures and activities, and the actual outcomes or effects in terms of personal experiences and lived realities, created a mental space for reflection and subsequent action, at least in the case of the university students.

It is not always possible to discuss or redress such incoherence. At the University of Zimbabwe, the researchers took it on as part of their research process. The researchers created the space where the research participants could articulate meanings that were more reflective of their actual experiences. The Zambia research diagnosed the inherent divisive nature of the open market system, and though recommendations were made that this would have to be changed for mobiles to contribute to effective social advocacy, within this project, no space could be created to address this incoherence.

Power and Intent

Women's empowerment, human development, the use of ICTs, and even this reflection on the potential of open ICT ecosystems for women's empowerment and human development do not take place in a power-free conceptual vacuum. Making visible the conceptual chains that link intent (behind activities and measures) with activities, meanings, and outcomes, and questioning these chains in terms of coherence, can serve to keep open development aligned with the actual intent and real meaning of human development. This conceptual chain is constantly challenged by the corruptive influences of (gender) power dynamics in both the environment and the minds of the involved human parties.

It seems to me that the dynamics of institutionalized power, such as those vested in systems of financial and patriarchal control, need to be countered with more power and energy than the dream of openness can muster.

It would thus be good to have the "outsider" conceptualization of openness strengthened by a project-specific normative intent that would resonate with, or originate from, the "insider" intent. This would not only contribute to the acceptability and sustainability of the open development efforts, but it would also diminish the danger that the dream of openness itself would be lost or become a corruptive force itself. While the "outsider" intent of openness may have its rationality in the fora where it originated, the participation of the beneficiaries in these development efforts derives its power and energy from the "insider intent." It is my contention that the success of GRACE as a network can be attributed to the fact that the individual GRACE members are continuously stimulated to deepen their alignment with their own intent—the dream they have for themselves in being a member of the network.

Detecting—or better still, preventing—lack of coherence and maintaining alignment among a development effort's intent, the way it is experienced, and the outcomes it yields require active and in-depth participation from those who are intended to benefit from it. This brings to the fore the importance of research and communication processes within open development efforts that involve or affect women.[2] Acknowledging, voicing, under-

2. The fact that the incoherence discussed in the Zimbabwe case study only became obvious through and during the research efforts also raises quite a few questions about the validity of meaning given to not only open development efforts, but to ICT4D projects and ICT4D research efforts in general, especially in terms of their claims of development and empowerment: There may be a lot of incoherence "out there" that has not been detected yet.

standing, and engaging the insider intents that women bring into open development processes are challenging endeavors. Bridging these insider intents with "outsider" intents will add another layer of communication, contextualization, and negotiation. It seems to be likely that new methods would have to be designed, and the methodology of such endeavors would have to be thoroughly thought through. Yet given what is at stake, this seems to be a relatively small and very wise investment to make. ■

References

Abraham, K. B. (2009). The names in your address book: Are mobile phone networks effective in advocating women's rights in Zambia? In I. Buskens & A. Webb (Eds.), *African women and ICTs: Investigating technology, gender and empowerment* (pp. 97–104). London and Ottawa: Zed Books and IDRC.

Comfort, K., & Dada, J. (2009). Rural women's use of cell phones to meet their communication needs: A study from Northern Nigeria. In I. Buskens & A. Webb (Eds.), *African women and ICTs: Investigating technology, gender and empowerment* (pp. 45–55). London and Ottawa: Zed Books and IDRC.

Gurumurthy, A. (2010). From social enterprises to mobiles—Seeking a peg to hang a premeditated ICTD theory. *Information Technologies & International Development, 6,* Special Edition 2010 (Harvard Forum II Essays), 57–64.

Hill, M. (2003). Development as empowerment. *Feminist Economics 9*(2–3), 117–135.

Mbambo-Thata, B., Mlambo, E., & Mwatsyia, P. (2009). When a gender blind policy results in discrimination: Realities and perceptions of female students at the University of Zimbabwe. In I. Buskens & A. Webb (Eds.), *African women and ICTs: Investigating technology, gender and empowerment* (pp. 67–76). London and Ottawa: Zed Books and IDRC.

Moddel, P. (2009). Intent and the process of becoming conscious: A phenomenological view. Society for Scientifc Exploration. Available at: http://www.scientificexploration.org/talks/27th_annual/27th_annual_moddel_p_phenomenology_intent.html

Smith, M., & Elder, L. (2010). Open ICT ecosystems transforming the developing world. *Information Technologies & International Development, 6*(1), 65–71.

Smith, M., Elder, L., & Emdon, H. (2011). Introduction to the special issue on open development. *Information Technologies & International Development, 7*(1), iii–iv.

Sutton, J., & Pollock, S. (2000). Online activism for women's rights. *CyberPsychology & Behaviour 3*(1), 699–706.

Introduction: *ITID* Book Reviews

We're pleased to announce *ITID's* new Book Reviews section, which is making its first appearance in this special issue. Focused on an IDRC publication, Revi Sterling's review of *African Women and ICTs: Investigating Technology, Gender and Empowerment* by Ineke Buskens and Anne Webb (Eds.) is an excellent complement to the rest of the issue. Sterling offers a constructive and engaging assessment of a volume that should be of interest to many in the *ITID* community.

As the new Book Reviews Editor, I'm looking forward to welcoming more such contributions, on anything from "core" ICT4D textbooks to edited volumes and monographs from adjacent fields. It is my goal that, like the journal itself, *ITID's* Book Reviews will reflect and strengthen the diversity of methodologies and disciplines that support our field. Researchers interested in contributing a review should contact me directly at jdonner@microsoft.com or the *ITID* editors at editors@itidjournal.org; similarly, publishers are encouraged to bring new volumes to our attention. I'll do my best to match potential volumes with qualified and interested reviewers. Thanks again to Revi Sterling for kicking us off. I hope you enjoy the review.

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Book Review

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Ineke Buskens and Anne Webb (Eds.). ***African Women and ICTs: Investigating Technology, Gender and Empowerment.*** International Development Research Centre (IDRC), London: Zed Books, 2009, 320 pp., ISBN 978-1-84813-192-7, $28.95 (paperback)/ $124.95 (hardcover). Also available to download free at http://www.idrc.ca/openebooks/399-7

Nowhere in the world do men and women enjoy perfectly equal access to, and benefit from, ICTs. While lauded for their transformative potential, ICTs intended for gender development represent one of the cruel ironies of our field: Women's advancement is critical to community development; their access to ICTs as information delivery mechanisms is an important component to this advancement; and the female gender experiences significant barriers to the access and use of ICT, thus never completing the promised circle or axiom. While the impediments to women's uptake of technology have been well-chronicled in Hafkin and Huyer's *Cinderella or Cyberella?* (Hafkin & Huyer, 2006), the UN/INSTRAW Virtual Seminar Series on Gender and ICTs (moderated by Huyer in 2002), BRIDGE's *Cutting Edge* series (BRIDGE, n.d.), and others, these barriers are often listed as a litany of inequities that the ICT researcher thinks is too big to solve alone. These barriers—cost, low literacy, access, lack of perceived relevance, and workload, among others—are real, and as general descriptions, are useful for conceptualizing difference. In *African Women and ICTs,* these lists are given the opportunity to mature. The work exposes us to the barriers as they manifest in a variety of anxieties and contradictions. This is in itself challenging to observe—after all, it is far easier when we can consider women a monolithic entity (i.e., not male) in development efforts. This categorization masks the real reasons women lag behind men in technology uptake, and exposes the realities that underlie the more widely-accepted barriers.

It is this diversity of experiencing technology that Buskens and Webb demand we recognize, starting with an assignment to meditate on our position vis-à-vis women and technology. While this did lead to a few uncomfortable moments in my ICTD seminar, the editors emphasize the need to center the researcher and reader in any exploration of women. In doing so, we can create a climate of useful reflexivity, examining our gendered self, our biases and insights, and what the editors call our "sexist filters" (p. 14). That women can possess such filters is another uncomfortable truth hiding beneath gender and technology efforts.

For those whose work explores the gendered dimensions of ICTD, it is no surprise that the editors and champions of the GRACE (Gender Research in Africa into ICTs for Empowerment) project are women. Likely, the most avid reader of *African Women & ICTs* is also a female researcher. Having such an easily identified audience is a mixed blessing, but also having a predictable and appreciative readership is a benefit, although it is not a stretch to imagine whose bookshelves contain a copy. While this readership no doubt includes a handful of men, the majority are likely to be the women ICTD practitioners and researchers who were dismayed to

discover that the Women's Caucus at WSIS in 2005 was relegated to a separate site, or to find that their talks about ICT and Gender were scheduled last at conferences. The United Nations Development Programme (UNDP) and International Telecommunication Union are incorrect in the claim that, "without data, there is no visibility; without visibility, there is no priority" (Hafkin, 2003). There is an abundance of data to demonstrate gender discrimination in technology initiatives; however, gender and technology remains an evergreen issue in reporting parlance. It is timeless and unsurprising, and thus does not qualify as hot topic unless someone who should know better lets something sexist slip.

Buskens and Webb follow a more interesting approach than that of the standard "add women and stir" approach to technology; they cast technology in a different light, rather than spotlight women. Their book tracks the first outcomes of the 14 research sites that comprise the Gender Research in Africa into ICTs for Empowerment (GRACE) Project. The methodological approach to the GRACE project is grounded in participatory action research (PAR), where both the process and result of the development effort are a political shift in the status quo and the "uncovering" of knowledge, as better explained by such researchers as Cornwall, Jewkes, and Chambers (Cornwall & Jewkes, 1995; Chambers, 2005). In UNDP's 1997 publication, *Sustainable Livelihood Approaches in Operation: A Gender Perspective* (Katepa-Kalala, 1997), participatory action research is cited as an effective practice for incorporating gender and technology issues. In *African Women and ICTs,* the variety of PAR-inspired qualitative methods employed across several Africa countries lead to significant contributions in ICT and Gender studies. While ICT for Development (ICT4D) research is often focused on one specific community under the assumption that this provides for ethnographic depth, the diversity of localities and women in the GRACE project uncovers subtle structural and psychosocial factors that would not reveal themselves in totality if the focus centered on one community or region.

If there is one overriding message in *African Women and ICTs,* it is to recognize the plurality of women's experiences with ICTs. The second message is to listen. These demands frame the editors' introduction and serve as a leitmotif throughout the chapters. The editors' introduction starts with a poem intended to mentally and emotionally center the reader. Buskens and Webb enjoy playing "gotcha" with convention. Opening with poetry may put some readers off the book, given that ICT and gender is already entrenched as a soft issue, an important afterthought. The emotive imagery in the poem is not part of the ICTD lexicon, but a meditation on self-reflexivity. It is one of the "methodologically innovative" mechanisms for getting right-sized before conducting (or reading) thoughtful gender research. This is an overlooked task in ICTD courses, a chance to know our neuroses before they become amplified by the strained conditions and tensions of fieldwork. The value of poetry as a practical research method may be worth the academic awkwardness.

Perhaps the most useful chapter from a research point of view is Buskens' first chapter, where she delves into the realities of doing research with and about women and ICTs—these are the complexities that field researchers know and feel internally, but can rarely articulate. Buskens describes these intangibles and the cost of ignoring their heft. For the researcher familiar with the moving target of action research, this exploration of anxieties and "adapted preferences" (p. 13) is welcome and grounding. The book then is divided into four parts that map women's relationships with ICTs: (1) passive relationships, (2) relationships where women create female-only spaces through and with ICT, (3) active relationships where women challenge gender and power roles through the use of ICT, and (4) relationships where women have appropriated ICTs to change the dynamics of the public space (be it the home or the international arena). These are not necessarily linear stages, but studies of agency and complexity across a range of ICT-based women's empowerment initiatives. While the overall number of research participants is small in most cases, the spectrum of women's experiences and responses to ICT is exhaustive. Even critics of qualitative research would likely agree that a larger sample size would only supplement the existing findings.

The 17 case studies following Busken's first chapter test the assumption that all women can benefit from ICT access and use, and that technology will expand the "assets and capabilities of women" (p. 22). These cases examine the everyday dynamics that are rarely uncovered in ICT and Gender research—the social, economic, and material realities of women's lives that trigger women's responses

to technology. Even in the most participatory of exercises, we often do no more than identify these responses as the root cause of inequities of access and use. We do not know where to look for the triggers, as we are several steps past them when we ask members of a community what they need in a technology. Some of the triggers produce forehead-slapping moments—why *should* women in rural Mozambique spend their resources to use the telecenter when there is no employment pipeline for women with newly-acquired technical skills? Other gendered barriers to ICTs seem to follow their own Occam: Women in a rural region of Nigeria rarely text due to extremely high illiteracy rates, although we professionals have come to believe that SMS is the lingua franca of ICTs. In Zimbabwe, we see how gender-blind policies at a university hinder women's access to the school computers. As a policy, women and men are supposed to enjoy equal access to the hardware in the library and labs. However, the first-come, first-served system of access works against the majority of female students who have different demands on their time, and who live under societal expectations of how such time is spent. The women interviewed did not view this as gender discrimination, but rather the way of the world.

Exclusion is a commonality in all the case studies, region independent, and sometimes perpetuated by women. A Zambian case study discovers an interesting fact about the names in women's mobile phone address books. The cachet of adding increasingly more prestigious names to one's mobile network disadvantages the less-networked and lower-earning, thus creating a lower class of mobile users. As one respondent states, "When you have names of poor people in your phone book, you will not have much access to your own development through your phone" (p. 99). This is further evidence that human-based social networks existed prior to technical social networks; technology mirrors the power relations of those networks. There is another critical takeaway—while we focus on the uneven development between men and women, we need to also look for the more subtle, uneven development cycles among women. There is no female monolith.

These are findings and suggestions that can be generalized, not just to women, but to all communities where we plan ICTD interventions. Having read these case studies, I have an enhanced understanding of the issues at stake. Thoughtful ICTD efforts are not only about translating human need into technical systems, but also about recognizing the goals and limitations of potential users, as well as studying how power dynamics flow within a community. Thus, I am torn by the title of the book. All ICTD practitioners and researchers will be able to form more effective research models and survey instruments after reading *African Women and ICTs.* Somewhere under the title, I want to read: "This is not just about African Women. Read it."

As fair notice, the chapters are not equally educational. Several primarily echo the findings of more widely-known studies. They are, in essence, "safe" case studies that discuss the contradictory nature of ICT for women as both a potential avenue for economic development and personal empowerment, as well as a disruptive force that can reinforce gender roles as much as challenge them. The lack of mentoring, the subtle glass ceilings, and the shallow pipeline of young technical women—these are the evergreen laments. ICTs are cast as multidimensional, and society is deemed in need of a critical systemic overhaul of the institutions and mores that create and sustain gender inequity. That said, the plurality of voices in these studies demonstrates the power of many truths—there are women who can use ICT within the confines of their home to pursue economic development and there are those not allowed to do so. Reiteration is not necessarily the same as retreading—some of the cases remind us that infrastructure, like ICT, is political. A full 90% of rural African communities remain off the electrical grid—and a majority of that 90% are women.

Such facts ground the reality of gender and ICTD projects, which may be the greatest contribution of *African Women and ICTs.* It is the everyday experiences of the women chronicled that are the most surprising to our conventional wisdom about women and technology in Africa. Yet Buskens and Webb provide a rich set of examples and tools to emulate within other contexts to uncover experiences that are otherwise too easily and incorrectly explained in the lists of gendered barriers already discussed. The seemingly challenging and counterintuitive perspectives in the 17 case studies offer us a way to truly "see" the authentic discursive practices that we haven't otherwise recognized. These are the tools that can reverse the cruel ironies.

While ICTD professionals will deny themselves an

important academic and practical opportunity if they do not read *African Women and ICTs,* we readers await the next book on GRACE as Phase II expands to include 27 additional sites. Similar efforts continue to gain momentum as well: Organizations such as LinuxChix Africa work to understand and address these issues, and female ICT professionals from Senegal, Kenya, Egypt, Nigeria, Turkey, Brazil, and Pakistan have been recognized as "change agents" at international events, including the Grace Hopper's Celebration of Women and Computing. There is an opportunity for GRACE to highlight these connections and build bridges between South/North and South/South communities of women who continue to challenge assumptions and create their own conventional wisdom and future for ICTs. ■

References

BRIDGE (n.d.). *Cutting edge packs.* Retrieved December 2, 2010, from http://www.bridge.ids.ac.uk/go/bridge-publications/browse-by-type/cutting-edge-packs

Chambers, R. (2005). *Ideas for development.* London: Earthscan.

Cornwall, A., & Jewkes, R. (1995). What is participatory research? *Social Science of Medicine, 41*(12), 1,667–1,676.

Hakfin, N. (2003). *Some thoughts on gender and telecommunications/ICT statistics and indicators.* ITU World Telecommunication/ICT Indicators Meeting. ITU Headquarters, Geneva, July, 7–9, 2003. Retrieved November 14, 2010, from http://www.itu.int/ITU-D/gender/documents/ICT_Stats/Hafkin.pdf

Hafkin, N., & Huyer, S. (2006). *Cinderella or Cyberella?: Empowering women in the knowledge society.* West Hartford, CT: Kumarian Press.

Katepa-Kalala, P. (1997). *Sustainable livelihood approaches in operation: A gender perspective.* UNDP International Working Group on Sustainable Livelihoods. Retrieved January 20, 2011, from http://www.sustainable-livelihoods.com/pdf/slainoperation.pdf

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