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Forum Article

Open ICT Ecosystems Transforming the Developing World

In the years following 2008, developing countries as a whole may invest as much as US\$100 billion annually in information infrastructure (Khalil & Kenny, 2008). In addition, the rapid expansion of mobile phones—even in the poorer regions of the world^{1,2}—and the emergence of the “social” (i.e., participatory and collaborative) Web³ are rapidly reshaping not only the ways people access and share information, but also how they relate, collaborate, and organize (Benkler, 2006; Shirky, 2008). These new technologies, most notably information and communication technologies (ICTs), offer new and transformative applications and services, means to communicate and produce content, and decentralized innovation models (Heeks, 2008).

¹ There is an estimated global penetration level of 61% for mobile phone subscriptions (International Telecommunication Union, 2008).

² Kenny and Keremane (2007) estimate that the mobile footprint covers as much as 77% of the world’s population.

³ Often called “Web 2.0.”

In this context of expanding ICT networks and applications, Khalil and Kenny (2008) appropriately ask, “How can we catalyze the impact of ICTs on development?”

The hypothesis of this paper is that open social arrangements, enabled by ICTs, can help to catalyze the development impacts of ICTs. In other words, *open ICT ecosystems provide the space for the amplification and transformation of social activities that can be powerful drivers of development*. Note that an ICT ecosystem⁴ is understood to be more than just a technological system; rather, it is a social system within which ICTs are embedded.

Defining “Open”

“Open” and “openness” are not novel concepts in relation to human activities. Democracy and participation represent an opening-up of decision-making processes to more people. Transparency and accountability represent an opening-up of organizations, people, and processes to scrutiny and feedback loops. Recently, more and more activities are emerging with the word “open” appended to an existing term, such as open government, open access, open education, open source, open hardware, open cities,⁵ and even open money.⁶ As each of these terms implies similar, but differing, meanings of “open,” it is essential to be clear about our own definition. For the purposes of this paper, 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/institutions; and*
- c) ***Collaborative** over centralized production.*

⁴ “An ICT ecosystem encompasses the policies, strategies, processes, information, technologies, applications and stakeholders that together make up a technology environment for a country, government or an enterprise” (Open ePolicy Group, 2005).

⁵ See http://www.creativeclass.com/creative_class/2009/06/01/creating-the-open-city/

⁶ See <http://openmoney.info/techne/index.html>

Note that openness is not one end of a binary dichotomy (closed and open); rather, openness is a range, from less to more open⁷ (see Table 1 for examples of openness activities). Importantly, the degree of openness in this range is a function of a variety of determinants. For example, the level of openness of particular content is generally a function of ownership, raising issues and arguments about intellectual property rights, the commons, and public goods. However, property regimes are but one (albeit important) component of the many that determine the overall degree of openness.

Table 1. Social Environments and Activities Ranging From Less to More Open. For simplicity’s sake, we have listed mostly technologies (e.g., books, dial-up), but the social activity and arrangements are implied.

Activity/Good	Less	← Openness →	More
Open Society	Limited right to assembly	Freedom to assemble	SMS & social networking sites (e.g. Facebook) as political organizing tools
Media	State controlled media	Corporate controlled media with some competition	Independent or distributed media (e.g., blogs)
Cultural Content	Books	Radio/television	Collaborative production of content (YouTube, open source movies)
Government Decision-Making	Centralized decision-making	Provide information and perhaps some forms for feedback (e-mail address, etc.)/polling/surveys	Participatory decision-making (e.g., participatory budgeting)
Government Information Provision	Provide data in paper format for those who can come in and get it (e.g., government owned/collected spatial and demographic data)	Provide data online (e.g., publicly available spatial data—aerial imagery, municipal boundaries, aggregated census data, etc.)	Provide (re)usable data online or collaborative development of data (e.g., participatory GIS using government-sponsored spatial data)
Government Service Provision	Provided by offices	Offices and e-services	Co-creation of services
Software Development/Provision	Proprietary software	Software APIs	Open source collaborative development

⁷ Shirky (2008) describes a similar range of activities as the following: sharing, cooperation, collaboration, and collectivism.

Personal Communication	Location bound	Phone lines	Asynchronous, synchronous, and location-independent
Devices	Proprietary/patented hardware	Open software devices (e.g., Open Moko)	Open hardware
Science/Research	Pay science journals, proprietary research data	Online open journals	Open research data and open data for research
Education Resources	Textbooks	Educational content online/free	Open use and re-usable educational content
Information Production/Provision	Reference books, etc.	Digital reference books available online	Collaborative information development (Wikipedia, collaborative educational content, etc.)
Internet Access	Dial-up	Broadband cable and/or licensed spectrum wireless	Open wireless/mesh networks

Open ICT Ecosystems and Development

ICTs enable social change through their core mechanisms of information storage, processing, and communication. Given the central role of information and communication in the coordination of social activities, it is not surprising that successive rounds of ICTs have played a role in transforming social life, from paper to the printing press, telegraph, and so on (Kallinikos, 2001). Each successive round of new ICTs brings new possibilities to improve or transform human activities and relationships. The openness hypothesis proposed in this paper is predicated on the emergence and diffusion of a new round of ICTs—mostly mobiles and the social Web. When these new technologies constitute part of an open “ICT ecosystem,” they provide a space for new social activities that bring benefits such as efficiency, innovation, and growth (Open ePolicy Group, 2005).

Consider the increased access and connectedness that the ubiquity of mobiles brings and the novel social activities and outcomes for which they provide the opportunity. In 2001, Manila residents, angered by a perceived injustice, organized a protest using SMS that led to the fall of the Estrada presidency in four days (Castells, Fernandez-Ardèvol, Qiu, & Sey, 2007, p. 187). M-

PESA, a mobile-based banking system in Kenya, provides branchless banking services to Kenyans who otherwise have no access to such services (Morawezysik & Miscione, 2008). Governments now expand services to hard-to-reach citizens through mobiles (m-government) (Song & Cornford, 2006). Mobiles also allow previously disconnected farmers and fishermen to access market information in real time, increasing market efficiencies and reducing resource waste (Abraham, 2007; Veeraraghavan, Yasodhar, & Toyama, 2009). It is no surprise that mobile phone access has been linked to increased national GDP (Waverman, Meschi, & Fuss, 2005).

Likewise, consider the participatory and collaborative potential of broadband Internet with collaborative software and a legal environment that allows sharing content and knowledge. For example, open source software presents potential benefits to developing country institutions such as governments and universities (Sahraoui, 2009). Although results have been mixed (van Reijswoud & de Jager, 2008), countries such as Brazil have begun to mandate that the public sector use nonproprietary, open source software (Kingstone, 2005). In South Africa, a consortium of 18 local and international organizations has created freely accessible educational resources and course design guidance for teachers in sub-Saharan Africa.⁸ In Egypt, Facebook enabled political organizing that has been comparatively difficult to clamp down on (Wolman, 2008). Models are emerging for “apomediation”, a variation of disintermediation, in health care: trusted users, friends, and networked collaborative rating, recommendation, and filtering processes provide important credibility cues and meta-data that empower individuals to navigate the sometimes overwhelming health information available online (Eysenbach, 2008). One can only imagine the possibilities as we move closer to a convergence of these technologies (mobiles and social platforms).

⁸ See the consortium’s web page: <http://www.tessafrica.net/>

The power of opening up ICT ecosystems comes also from the virtuous cycle that it can put into motion. As sharing and collaboration are established as norms, the benefits of sharing increase. The increased prevalence of open content keeps the price of competing content low, and collaborative models are emerging that allow for filtering and rating of content to ensure quality in the midst of potential data overload. The establishment of standards opens up a new range of possible cross-platform activities that encourage others to accept those standards. The success of open models breeds their application to more and distinct activities. For example, businesses are discovering mechanisms allowing them to benefit from opening up proprietary information. Saif et al. (2009) have even applied the paradigm to improve Internet access by allowing users to “share” downloaded content over peer-to-peer dial-up connections. Openness breeds more openness.

Indeed, openness appears to be a game-changing force. Consider how Craigslist, an extremely simple Web site for classifieds ads, is undermining a traditional revenue stream of newspapers.⁹ Or, take the recent success of the new media component of Barack Obama’s presidential campaign, which applied the principles of transparency, authenticity, and participation with powerful mobilization and motivation effects. After the Massachusetts Institute of Technology (MIT) opened-up its courses through Open Course Ware (OCW), it became more difficult for competing universities such as Stanford to charge for its software. Consequently, many universities have followed MIT’s suit (Smith, 2009). This opening-up of content has also had an impact on otherwise closed regimes. China, for example, has vacillated between the benefits of allowing access to MIT’s OCW and the potentially subversive content matter.

⁹ See, for example, <http://nymag.com/nymetro/news/media/internet/15500/>

A story is emerging that connects open ICT ecosystems to human development, although we are just beginning to explore the possibilities. More open ICT ecosystems can massively increase the diffusion of content and the possibility for people to make sense of the information in their particular contexts. Low-cost devices, open content models, and communication tools such as P2P sharing open up both the information and communication channels that make universal access to information a less idealistic and more realistic goal. If knowledge is a driver of development (Benkler, 2006, chapter 9; Mansell & Wehn, 1998), more democratic access to information is one component of more equitable development. Furthermore, massive access and sharing makes possible the reaping of the positive externalities from each new person accessing these public goods (Stiglitz, 1999).

These open spaces also help to unlock the creativity and energy needed for locally driven innovation. In particular, Heeks (2008) argues that per-poor innovations (by the poor and for the poor) are increasingly possible now, as they combine the flexibility of open (software/hardware) platforms and access to information with local contextual expertise. The innovative uses of mobiles to keep costs affordable for the poor, such as “beeping” and “missed calls” (Castells, Fernandez-Ardevol, Qiu, & Sey, 2007; Donner, 2008) or use of multiple SIM cards (LIRNEasia, 2009) are the first signs of these new possibilities.

Of course, the flip side of the equation must be recognized: open ICT ecosystems allow for the amplification and emergence of new socially detrimental activities. Messages of hate and intolerance and the spread of misinformation can be amplified. Possibilities for, and the sophistication of, online crime such as fraud, piracy, and child pornography grow as systems connect and more information flows over these networks. State surveillance is expanding, often faster than the legal regimes to keep it in check, in both democratic Western and autocratic

countries. Personal privacy is threatened by the growing ability to cross-reference data collected in the course of public and private activities, activities that are increasingly mediated by connected networks. Of course, the use of new technologies for both positive and negative ends is not a novel concept, and as these examples illustrate, ICTs applied in an open context are not exempt. Indeed, crucial to any policy and practice considerations is the necessity to negotiate the appropriate level of openness that balances the societal benefits with the costs.¹⁰

Openness at a Crossroads?

Benkler (2006), Lessig (2006), and Shirky (2008) have clearly stated that the policy choices we make now, especially in the realms of technological infrastructure and intellectual property, will have enormous implications on the future of society. For example, the current design of the Internet, which has enabled innovation on such a large scale, is the result of a fortuitous convergence of historical events, inventions, policy choices, cultural attitudes, and personal ingenuity; it could have easily been otherwise (Castells, 2001). The Internet is a network with intelligence located at the end-user computers and a “neutral” middle that treats all information flowing over the network equally, providing an amazingly flexible platform for end-users to innovate (Lessig, 2001). Policy and practice choices that reinforce or challenge the smart terminal and neutral middle design, such as digital rights management (DRM) technologies, have important implications for the resultant flexibility and innovation possibilities provided by the system. Similarly, IP laws established now in relation to free trade agreements between developed and developing countries that do not take into consideration these dynamics may

¹⁰ The definition of benefits and costs are often normative, and yet many of the issues related to technology and openness are actually putting into question traditional norms. For example, “piracy,” which could be considered a “cost” of an open architecture by the owners of products and content, may also be seen as a legitimate way to share knowledge, for which there would be broader societal benefits.

ultimately limit the availability of important resources (such as educational content) to low-income countries. Already, there is evidence emerging that this is occurring (ACA2K, 2009).

The takeaway point is this: A more sophisticated theoretical and empirical understanding of the societal benefits and detriments of more open systems is needed to inform current models of practice and policy that will profoundly shape the openness of our ICT ecosystem in the future.

Research Implications

The argument presented in this paper suggests a research focus on a unit of analysis that works at a level above specific ICTD applications: *the new social activities enabled by different configurations of ICT ecosystems and their connections with particular social outcomes*. This will be an increasing range of new-form ICT-enabled social practices, such as massive participation, collaborative production of content, collaborative innovation, collective information validation, new “open” organizational models, and standards and knowledge transfer, to name a few. These examples are modules of social practices that can be applied to solve similar problems across different development domains. For example, models of co-creation of services might be applicable with small variations in the health, education, and government services. Variations of open source collaboration techniques are applicable for the generation of software and educational content, as well as for solving problems that are traditionally difficult for relatively small teams (Shirkey, 2008).

Research is also needed on the specific dynamics of these new forms of ICT-mediated sharing, cooperation, participation, and collaboration. How do you establish standards to facilitate sharing among groups? What are the different organizational structures that are appropriate for the desired outcomes in different domains and contexts? What are the sets of

individual or group barriers to engaging—and what are the incentives? What are the different cultural influences on the formation and use of these open spaces?

Finally, research needs to identify and understand the policy factors and emergent issues that shape the possibilities for, and nature of, future social innovations, such as the very real tensions between increased access, surveillance, and privacy. Spam, fraud, hacking, and other cyber crimes threaten the unfettered use of open arrangements and need to be effectively countered. Balance must be negotiated between creating the incentives for the continued development of technological infrastructure and ensuring that all segments of society have access to the technology. National and international IP laws must balance the need for providing innovation incentives, allowing the flexibility for new models of sharing, yet not stifling creativity.

Final Word

Today’s policy and technological interventions, whether they be in the form of copyright and patent laws, technological design (DRM, for example), or even the roll-out of mobile phones, will have profound repercussions on the extent to which communities in the developing world benefit from greater access to technology. Our assumption, as discussed, is that building openness into policies and technologies will result in greater opportunities for developing countries to transform into equitable and sustainable knowledge societies. However, that assumption needs to be tested. We certainly hope that our organization and others can play a role in testing the hypothesis and therefore build the evidence base to help feed the debate on the value of “openness” for development.

References

- Abraham, R. (2007). Mobile phones and economic development: evidence from the fishing industry in India. *Information Technologies and International Development*, 4(1), 5-17.
- ACA2K. (2009). *Research findings from Africa in relation to WIPO development agenda priorities* (Briefing Paper): African Copyright and Access to Knowledge.
- Benkler, Y. (2006). *The wealth of networks: how social production transforms markets and freedom*. New Haven: Yale University Press.
- Castells, M. (2001). *The internet galaxy*: Oxford University Press.
- Castells, M., Fernandez-Ardevol, M., Qiu, J. L., & Sey, A. (2007). *Mobile communication and society: a global perspective*. Cambridge, Mass.: The MIT Press.
- Donner, J. (2008). Research approaches to mobile use in the developing world: A review of the literature. *The Information Society*, 24(3), 140-159.
- Eysenbach, G. (2008). Medicine 2.0: social networking, collaboration, participation, apomediation, and openness. *Journal of Medical Internet Research*, 10(3).
- Heeks, R. (2008). ICT4D 2.0: the next phase of applying ICT for international development. *Computer*, 41(6), 26-33.
- International Telecommunication Union. (2008). *Worldwide mobile cellular subscribers to reach 4 billion mark late 2008* (Press Release): International Telecommunications Union.
- Kallinikos, J. (2001). *The age of flexibility: managing organizations and technology*. Lund: Academia Adacta AB.
- Kenny, C. J., & Keremane, R. (2007). Toward universal telephone access: market progress and progress beyond the market. *Telecommunications Policy*, 31, 155-163.
- Khalil, M., & Kenny, C. (2008). The next decade of ICT development: access, applications, and the forces of convergence. *Information Technologies and International Development*, 4(3), 1-6.
- Kingstone, S. (2005, 7 June). Brazil adopts open-source software Online. Retrieved 24-October, 2009, from <http://onthecommons.org/content.php?id=543>
- Lessig, L. (2001). *The future of ideas: the fate of the commons in a connected world*. New York: Penguin Books.
- Lessig, L. (2006). *Free culture: the nature and future of creativity*. New York: Penguin Books.
- LIRNEasia. (2009). Innovative strategies to reduce communication expenditure. *Teleuse@BOP findings in brief* Retrieved October 26, 2009, from <http://lirneasia.net/wp-content/uploads/2008/04/missed-calls-and-other-strategies.pdf>
- Mansell, R., & Wehn, U. (Eds.). (1998). *Knowledge societies: information technology for sustainable development*: Oxford University Press.
- Morawezysnik, O., & Miscione, G. (2008). Examining trust in mobile banking transactions: the case of M-PESA in Kenya. In C. Avgerou, M. L. Smith & P. v. d. Besselaar (Eds.), *Social Dimensions of Information and Communication Technology Policy* (pp. 287-298). Boston: Springer.
- Open ePolicy Group. (2005). *Roadmap for Open ICT Ecosystems*: Berkman Center for Internet and Society.
- Sahraoui, S. M. (2009, April 17-19). *ICT governance in higher education: case study of the rise and fall of open source in a gulf university*. Paper presented at the 3rd International Conference of Information and Communication Technologies for Development, Doha, Qatar.

- Saif, U., Chudhary, A. L., Butt, S., Butt, N. F., & Murtaza, G. (2009). A peer-to-peer Internet for the developing world. *Information Technologies and International Development*, 5(1), 31-47.
- Shirky, C. (2008). *Here comes everybody: the power of organizing without organizations*. New York: Penguin Press.
- Song, G., & Cornford, T. (2006, October 12-13). *Mobile government: towards a service paradigm*. Paper presented at the 2nd International Conference on E-government, University of Pittsburgh.
- Stiglitz, J. (1999). Knowledge as a global public good. In I. Kaul, I. Grunberg & M. A. Stern (Eds.), *Global public goods: international cooperation in the 21st century* (pp. 308-325). Oxford: Oxford University Press.
- van Reijswoud, V., & de Jager, A. (2008). *Free and Open Source Software for Development*. Monza, Italy: Polimetrica.
- Veeraraghavan, R., Yasodhar, N., & Toyama, K. (2009). Warana unwired: replacing PCs with mobile phones in a rural sugarcane cooperative. *Information Technologies and International Development*, 5(1), 81-95.
- Waverman, L., Meschi, M., & Fuss, M. (2005). The impact of telecoms on economic growth in developing countries, *Africa: the impact of mobile phones* (pp. 1-21). Moving the debate forward: The Vodafone policy paper series #3.
- Wolman, D. (2008). Cairo Activists Use Facebook to Rattle Regime. *Wired Magazine*, 16.