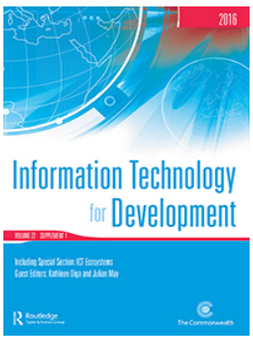

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EDITORIAL

The ICT Ecosystem: The Application, Usefulness, and Future of an Evolving Concept

Kathleen Diga[a*] and Julian May[b]

[a]*School of Built Environment and Development Studies, University of KwaZulu-Natal, Durban, South Africa;* [b]*Institute for Social Development, University of the Western Cape, Cape Town, South Africa*

Although we are almost a generation apart in age, with Julian cutting his digital teeth on a Univac 1108 and Kathleen hers on a Commodore 64, our recollections of using ICT are very similar. The new digital world was one of exploration and gaining new information, with a platform that was made for very simple navigation and text typewritten on a keyboard. There were little complications in operating the straightforward commands to the few channels of the freenet availed previously to the public via the public library system in the global North.

What was then observed as a simple tool for communication, in today's contemporary times, ICT is extended to include new and emergent complexities. Questions like "how does this information affect my privacy," "is this data reliable," or "what does this mean for network neutrality" make ICT usage a more complicated task than back in the 1990s. Creating or searching for information is no longer taken as a given; users are also challenged to consider the context of available ICT infrastructure, the constraints of affordability, skills disparity, and the consequences of what you do when contributing on the web. Finally, higher order questions are also further scrutinized in relation to human well-being: "do these technologies bring about improvements in the lives of people" or "have they given rise to new and different ways of doing things?" We live in a digital generation where implicitly embedded within the evolution of various technological advancements can come the exacerbation of income and wealth inequality (World Bank, 2016). As global citizens concerned with social justice, the ability to monitor and mitigate such harm to those most marginalized becomes the concern for us all.

We contribute to the field of information and communication technologies for development (ICTD) by offering a unique view of how ICT ecosystems may be conceptualized. This is an area growing rapidly in the digital space and finding the potential of research practice entrenched in global objectives such as through the United Nations' Sustainable Development Goals (ITU, 2015). ICTD is also an important focus of research conducted in, and by practitioners, scholars and activists living in developing countries. Researchers in ICTD generally acknowledge the imperative of inclusive participation from all regions and disciplines. An expanding and increasingly integrated ICT research community now has access to a rich, diverse, and potentially contradictory knowledge base of theory, practice, in-depth case studies, and large datasets. How then do we start to understand these complexities in a systematic approach?

In this issue, we offer a view of ICT as being embedded within the global, national, and local socio-economic context in which it is used. This ICT ecosystem

*Corresponding author. Email: digak@ukzn.ac.za

> … encompasses the policies, strategies, processes, information, technologies, applications and stakeholders that together make up a technology environment for a country, government or an enterprise. Most importantly, an ICT ecosystem includes people – diverse individuals who create, buy, sell, regulate, manage and use technology. (Open e-Policy Group, 2005, p. 3, see also Fransman, 2010; Smith & Elder, 2010; Toivanen, 2011)

This approach argues that information and communication technologies should not be viewed in isolation and as part of a closed technical system. Instead, the notion of an ecosystem seeks to embed ICT and its application in a wider conceptual framework that takes account of socio-economic, political, spatial, and other dynamics. The manner in which this system is constructed and operates is an aspect of emerging paradigms that consider the interplay between ICT multi-level usage by various players within systems of governance, citizenship, communication, knowledge, and innovation. In the Human Development Report of 2013, titled "the rise of the South," there is a distinction of countries like China, India, and Brazil, amongst others who are becoming major actors in the global reduction of poverty and overall global development through their own diverse and possibly unique mechanisms and paths (UNDP, 2013). This recognition is important, and it would thereby be useful to consider how the ICT ecosystem concept is applied through the perspectives of developing countries primarily located in the Southern hemisphere, or what is the emergent term of "the global South" and to question whether these viewpoints help us to understand the world in more complex and nuanced ways.

It seems likely that different typologies of ICT ecosystems can be identified in many countries of the world in which there are disparities in income and opportunity. These will have differing components, and have differing influences in the different systems. Some forms or components of the ICT ecosystem will result in outcomes that better foster social, economic, and political development. Furthermore, some forms or components of the ICT ecosystem will better foster the creation, access, adoption, and usage of new forms of ICT that have a positive impact on the intended beneficiaries. Other components of the ICT ecosystem will facilitate or mitigate against the participation of communities in the design, creation, and evaluation of new ICT. Cutting across this, gender, generation, class, ethno-linguistic characteristics, and other social dynamics influence the ICT ecosystem, and will be influenced by the ICT ecosystem. It is thus likely that the ICT ecosystem results in different outcomes for different groups within a country or community. Different ICT ecosystems will also respond differently to social, economic, physical, and political crises. This means that the roles being played by the state, private sector, and civil society will shape alternative ICT ecosystems, and the outcomes that might follow from these. How can we systematically understand these varying systems and context? We thereby propose an expanded illustration of an ICT ecosystem framework that takes on board the human factors and complexities within an ICT system. Previous frameworks had a primary goal of explaining ICT components for a national policy (Gillwald, 2012) or market-related dynamics and regulation. This revised framework goes further to firstly consider the elements of previous frameworks; the network operators, service, application, platform, and content providers (Fransman, 2010; Gillwald, 2012); and to place people in the center of the ecosystem who are influenced, and influence other parts of the system. This illustration recognizes that systems are made up by many mutually interacting parts, complex in their arrangement and characterized by interdependence (Bertalanffy, 1968). Arranged in sub-systems, each component contains its own networks and dynamics (Saaty & Kearns, 1985).

Secondly, in this special issue, there is further inclusion of concepts from the systems approach. The issue re-introduces the notion of "keystone species" (Nardi & O'Day, 1999, p. 53) which help facilitate between an ICT user and the available ICT, catering to the unique needs of the user (Sey et al., 2013). Such "keystone species" play a disproportionately large role in the system, and upon which the operation of other parts of the system depends (Paine,

1995). "Infomediaries" are proposed as one such keystone species and included as the ICT practitioners (also known as knowledge workers).

Finally, the factors of gender, generation, ethno-linguistic, historical context and affordability, access and utilization are placed within the elements as shaping the various relationships of people with the ICT system. This is then enclosed by institutional arrangement and national policies as well as global governance structures that further guide the usage of ICTs by various society members (from Gillwald, 2012). Ultimately, human well-being is either improved, remains the same, or degrades, resultant from this system of ICTs and human interaction, mainly leading to changes in an individual or household social, economic, and political outcomes (Figure 1).

Recognizing these concerns, this special issue hopes to connect the various contributions from diverse perspectives. Drawing on research undertaken in the global South is uniquely suitable; this special issue contributes toward further developing an emerging conceptual framework of the "ICT ecosystem."

To achieve this goal, in December 2013, we brought 40 early career researchers together in a pre-conference workshop held prior to the ICTD 2013 conference held in Cape Town, South Africa. We challenged them to interrogate this space which we labeled the "ICT ecosystem" and encouraged them to think about the work that we do in a way that interacts with the world around them, and where did their research work fit within this space. With the receipt of 240 abstracts, another 42 ICTD2013 pre-conference papers and a variety of peer-review processes, this special issue brings a culmination of the discussions which took place at that time of the workshop. Our discussions were also shaped by the participant's response to the death of the late South African President, Nelson Mandela which occurred during our workshop. Perhaps as a result of this, within this enquiry around the ICT ecosystem, many papers have considered issues

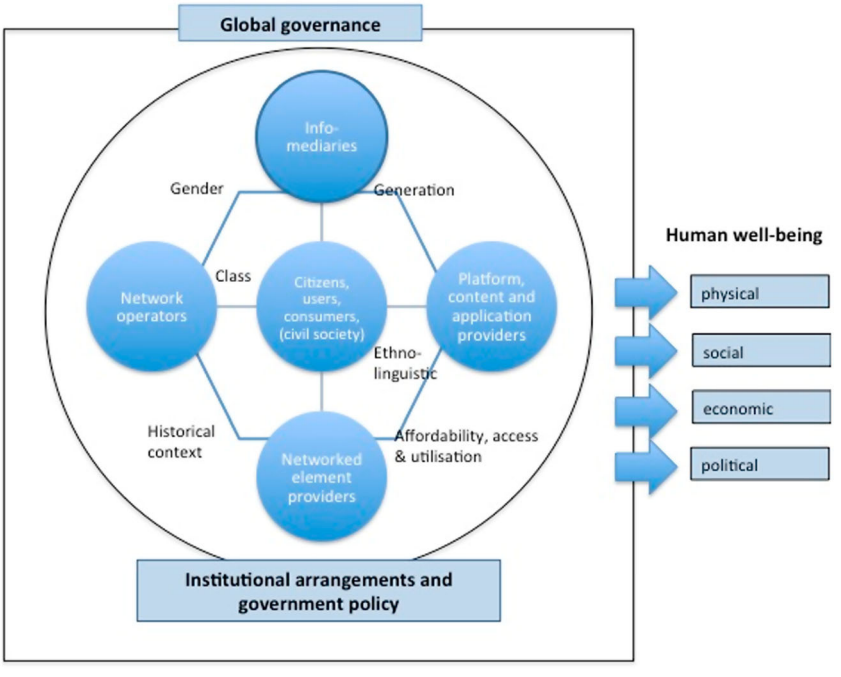

Figure 1. Enhanced ICT ecosystem framework.
Source: authors, adapted from Fransman (2010) and Gillwald (2012).

of equity and social justice. This is a very appropriate theme given the rising global interest in inequality.

Attempting to solve problems in an ICT ecosystem framework reveals that true participation in this space can be hampered by historical and structural legacies, affordability, and poor perceptions of ICTs. The effectiveness of ICTs needs to be immediate and demonstrate improvement of the systems in order to be accepted by the community, and targeted programs are an effective way to ensure inequities are addressed. Those at the margins or fringes of society are certainly participating in this space, but from what the papers reveal, this interaction can be at a truly limited capacity. Yet, a wide variety of structural and internal elements from the ICT ecosystem contribute to the improvement or deprivation of a person's quality of life. This special issue accomplished its goal to challenge authors to draw out further elaborations about their ICTD projects, diving further into theory and nuanced complexities, and thereby making their research articles rich contributions to this field.

Summary of the papers in the special issue

As to the specific papers within this special issue, Loudon's paper probes the existing ICT infrastructure and platforms, specifically the short message services (SMS) system to conduct development projects. She questions the initial intentions of the platform design from a historical perspective and argues that the rigidity of the platforms provides limited space for projects to support limited resourced projects. This paper considers the historic origins of today's communication digital devices such as SMS. These historical and structural limits hinder its tools in realizing goals for social development, which originally was not the forefront of its infrastructural objectives. Rather, social development is integrated as an afterthought in these platforms which thereby plagues the development institutions that are trying to use ICTs for meaningful socioeconomic development. In other words, the initial ICT structural limitations have not been built to accommodate for these new ICT initiatives and these uneasy relationships could potentially dampen the reach of m4d interventions to assist the poorest of the poor.

Ferriera et al. find that there are pockets of social support which are pushing the boundaries and ensuring that inclusion of the digital space is done as is seen in Brazil. This inclusion is nonetheless at varying levels. In some cases, the initiatives remain pilots and have not been mainstreamed into any long-term program. In Brazil, Ferriera et al. look at the case of a public access venue which is providing ICT facilities and specific resources for older people within the community. The premise is that without such innovative programming provision, the elderly (they are also found to be amongst the poor) are held back from participating in a digitally forward society.

While the Brazil case takes note of targeted interventions, Kibere's case in Kenya reveals the take up of youth who use their own resources to stay connected to their networks. While there is great promise for ICTs to open up communications across previous barriers, Kibere's study finds youth in the Kibera slum utilize their phones to network mainly with their peers in this local community. Expanding out of the slum network, despite the offers of an open society within a Kenyan ICT ecosystem, is limited. Social class appears to stunt the social mobility of these youth who had hoped for greater opportunities for networking within this digital age. Despite efforts to mask various social markers of living in a low-income community, the chance to expand networks beyond the informal settlement poses more challenges than what the users anticipate.

van Schalkwyk et al.'s paper questions transparency, governance, and more specifically the public institutions' ability to address issues of open data. The prospect of opening government and institutional repositories within research facilities to the public as information intermediaries

appears to be playing a key role in improved accessibility to these data. The "keystone species" (Nardi & O'Day, 1999, p. 53) are those mediators or those entities that bridge and translate information across platforms in what is described as a fluid process. The data themselves are wealth and the ability to leverage an open data platform to facilitate the data reforms in a country may add value, and in this case assist South African university planners to make informed decisions.

Sticking with the theme of university institutions, Muriithi et al. reflect on the realities around the expansion of ICT platform use for Kenyan research collaborations. Despite the availability of the latest platforms for collaboration, the Kenyan researchers in the study are found to stick with the fundamental email function and mobile phone devices to communicate within their global teams. Other ICT platforms are available to expand collaborative practice, but this study scrutinizes its use due to resource-bound factors and structures within which they operate.

Concerned with better understanding the affordability context of mobile telephony, Rey-Moreno et al. use their evidence to influence institutions and policy to take a more inclusive approach to ICT for development. Rural areas are continuously placed at the periphery when provisions of ICT infrastructure and tools are brought to the fore. In the South African case, the high costs of communication drive users to either no or little use of the available devices because of the limited budgets (in this case, mainly users or non-users are recipients of government social grants). This article expands on some of the expenditures and costs which are taken up by the community; the hidden expenses are verified, further expanding on our understanding of the higher costs of communication in rural areas compared to those in urban areas. The high costs thereby help to justify the need for alternative communication solutions for such poor communities to participate in the use of ICTs.

Cañares sets out to evaluate the local governance changes in Bohol, Philippines when ICTs are implemented within the taxation system of its respective municipalities. He specifically attempts to show the changes in tax revenues and processing times within the area. Furthermore, the article captures the perception changes of tax-paying citizens and civil servants engaged with the tax system. Through the lens of participation, rule of law, transparency, responsiveness, and efficiency, the author brings to light how ICT use in most cases has enabled institutional reform at the sub-national level. The article makes use of the ecosystems approach to embed this case within the larger context of Philippine governance as well as a global departure toward transparency practices. Finally, the ability for the system to produce immediate results have helped to gain the buy-in of the province and its municipalities, as well as becoming a learning site for other local government units interested to improve local taxation mechanisms.

This special issue came about through the recognition of more expanded and alternative ways of thinking of ICTD. It was also recognized that few of the papers accepted at international conferences concerned with ICTD are from authors living in the global South. As a result, we believe that there is the risk that a less rich diversity of knowledge is building toward the methodology, ontology, epistemology, and axiology of ICTD. Furthermore, we are concerned that there is inadequate recognition of the role that global South based researchers can and do play in improving the conditions of their own communities. With the support of the International Development Research Centre (IDRC), these special issue authors made a specific intervention to increase the participation at ICTD2013 by scholars based in the global South, particularly through their contributions to the emerging topic of human development from an ICT ecosystem perspective. This purposive intervention hopes to build the scholarship of the global South in order to amplify contributions that move beyond data collection, and rather add value to theory testing toward broader knowledge production. The long-term hope is for this to be the start of improved global South scholarship for future conferences and journals, and for better and more equal collaborations between all stakeholders in ICTD. We thank all the mentors, guest speakers, peer reviewers, and the participants themselves in making this special issue a rich experience.

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Notes on contributor

Kathleen Diga is the Researcher under the programme, South African Research Chair in Applied Poverty Assessment at the School of Built Environment and Development Studies, University of KwaZulu-Natal (UKZN), South Africa. Her main focus of research is in the poverty and economic dimensions of information and communication technologies for development.

Julian May is the Director of the NRF-DST Centre of Excellence in Food Security at the University of the Western Cape. He has worked on options for poverty reduction including land reform, social grants, information technology and urban agriculture in Africa and in the Indian Ocean Islands.

References

Bertalanffy, L. (1968). *General systems theory*. New York: George Braziller.

Fransman, M. (2010). *The new ICT ecosystem: Implications for policy and regulation*. Cambridge, UK: Cambridge University Press.

Gillwald, A. (2012). Review of department of communications' colloquium on an integrated national ICT policy. Research ICT Africa. Retrieved May 15, 2012, from http://www.researchictafrica.net/docs/ICT_colloquium_SA.pdf

International Telecommunications Union. (2015). ICTs for a sustainable world. Retrieved December 1, 2015, from http://www.itu.int/en/sustainable-world/Pages/default.aspx

Nardi, B., & O'Day, V. L. (1999). *Information ecologies: Using technology with heart*. Cambridge, MA: MIT Press.

Open e-Policy Group. (2005). *Roadmap for open ICT ecosystems*. Cambridge, MA: Berkman Center for Internet and Society. Retrieved from http://cyber.law.harvard.edu/publications/2005/The_Roadmap_for_Open_ICT_Ecosystems

Paine, R. T. (1995). Conversation on refining the concept of keystone species. *Conservation Biology*, *9*(4), 962–964.

Saaty, T. L., & Kearns, K. P. (1985). *Analytic planning: The organization of systems, international series in modern applied mathematics and computer science* (Vol. 7). Oxford: Pergamon Press.

Sey, A., Coward, C., Bar, F., Sciadas, G., Rothschild, C., & Koepke, L. (2013). *Connecting people for development: Why public access ICTs matter technology & social change group*. Seattle: University of Washington Information School.

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

Toivanen, H. (2011). From ICT towards information society. Policy strategies and concepts for employing ICT for reducing poverty. Retrieved from http://www.vtt.fi/inf/pdf/workingpapers/2011/W158.pdf

United National Development Programme (UNDP). (2013). *Human development report 2013*. New York: United National Development Programme.

World Bank. (2016). *World development report 2016: Digital dividends*. Washington, DC: World Bank.