Growth in ICT uptake in developing countries: new users, new uses, new challenges

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Editorial

Over the last 15 years there has been significant increase in the availability of ICTs in developing countries. Indicatively, it is estimated that fixed wired broadband internet subscriptions have increased from 71m to 357m between 2005 and 2013 (ITU, 2013). Most striking is the rapid uptake in mobile telephones. Mobile phone subscriptions in developing nations have increased from 1213m to 5235m between 2005 and 2013 while active mobile broadband subscription has increased rapidly from 43m to 1162m between 2007 and 2013 (ibid).

So who are the new users and what are the new uses of ICT in developing countries? Although universal accessibility to ICTs remains a serious concern, existing internet and mobile infrastructures support an increasing stock of information and communication applications in diverse fields of activity. Almost all governments in developing countries have ongoing information systems projects aiming at efficiency of administration and improvement of public sector services. Business firms increasingly use ERP systems to improve their management and join global supply chains. Entrepreneurs seek opportunities for new business on e-commerce platforms or cluster in digital innovation hubs for a place in the lucrative market of the global ICT products and services. Non-Governmental Organizations (NGOs) are another key user of information technology within developing nations. Indeed, many of the accounts in the literature to date have focused on projects that have been funded and /or initiated by NGOs. These have been across a wide range of areas such as health, education, poverty, gender etc. Further, activists in the civil society use social media to mobilize support for a large variety of developmental causes. The expectations for developmental effects from these uses of ICT are high. They include contribution to economic growth, the enabling of the achievement of UN Millennium Development goals in health and education (Byrne et al. 2011), the overcoming of historically accumulated dysfunctional and often corrupt practices in the public sector, and public mobilization towards desirable social and political change.

A small number of high profile innovation cases have attracted the attention of international development organizations and academic research alike as examples that highlight the developmental potential ICT. Perhaps the best known example is the MPESA case (Hayes and Westrup 2012**).** MPESA is seen as an exemplar of frugal/ low cost innovation. Its success is attributed to its flexibility as a payment system that allowed for many emerging and unexpected uses. Other contributing factors include the simple SMS technology and the

low-cost phones and payment costs. MPESA has been used for Microfinance, rural payments, urban-rural payments, as a safe place to store cash, and now as a bank. It has been shaped by the ongoing needs and requirements of an expanding user base. Another well-known case is the Grameen AppLab, which allowed for the sharing of knowledge about agriculture and animal husbandry, as well as buying and selling crops (World Bank 2012)**.** It quickly grew to a significant user base of knowledge workers and farmers who found new ways to use the system. What is important in both cases, is that though they had a large user base in developing countries, they were developed by global north corporations. In the case of MPESA, Vodafone and IBM (for payment processing) and in the case of Grameen, Intel and Google. This raises questions about the development of in country expertise, operational resources, capabilities, funding, control, and in the case of MPESA, revenues.

Impressive innovation cases such as MPESA and the Grameen AppLab are rare in developing countries. The achievement of expected key developmental effects, such as efficient and effective government, competitive industries and economic growth, is fraught with difficulties and overall remains disappointing (World Bank 2016). Indeed, despite the increasing diffusion of internet and mobile technologies, the distribution of physical access is far from uniform within and between developing countries. The latest data from ITU (2015) highlights that although 62.5% of internet users over the world are from developing countries, two thirds of people in developing countries remain offline. Further, there are great disparities in access in relation to socio-economic groupings, gender, age, and education. Indeed, some analysts and scholars of ICT and development have questioned the prudence of the assumption that ICT diffusion makes a difference to the socio-economic conditions in developing countries. Toyama, for example, concludes that ICT may reinforce existing weaknesses rather than contributing to overcoming them (Toyama 2011).

The observation that increasing diffusion of ICT in developing countries does not necessarily lead to expected socio-economic benefits should not be particularly surprising and does not negate the potential of ICT to contribute to life condition improvements in such countries. In the 1980s economists noticed and lamented that the acceleration of ICT diffusion often does not increase the rate of productivity growth (The Economist 2016). Research seeking to explain this counterintuitive observation identified a number of complementary factors as requirements for achieving economic benefits. They include management capacity for organizational reform (Brynjolfsson and Hitt 2000), regulation conducive to innovation, labour with skills for digital interactions, and incentives for employees to embrace the use of new technologies creatively (World Bank 2016, chapter 5). Consequently, the adage in the recommendations of international development institutions promoting ICTs in developing countries is the need to accompany ICT with complementary organizational, macro-economic and societal reforms.

'But the changes pointed out in economic and managerial theories as necessary complements to ICT implementation often prove an overwhelming challenge in developing countries.' Technical rational analyses cannot explain why or, for that matter, why under the same conditions of inadequate complementary factors some ICT innovation efforts manage to succeed even beyond their creators' expectations. To understand why, we have to turn to theories that unravel the processes of socio-technical change. Two clusters of foundational theories are drawn upon to that end in research on ICT innovation: theories of technology, which elaborate the causal relationship of technology artefacts and socialised human action in the construction of socio-technical phenomena, and theories of action which concern the relationship of human agency and social structure.

Theories of technology seek to explain how new technologies are constructed and come to make a difference in organizations. IS research in the 1970s and 1980s challenged technologically deterministic accounts of ICT and organizational change. The development of new technologies and their applications in organizations is not the inevitable outcome of discovery and technological progress. Technologies are constructed to satisfy the needs of specific social environments and their shaping is subject to social interests and power dynamics. Moreover, the achievement of organizational efficiency and effectiveness benefits from ICT implementation depends on the capacity of organisations to work out change of work processes (Kling 1980; Mumford and Weir 1979). However, just as we should not expect causal effects from technology alone, nor should we expect any determinate effects from the social environment. Instead, IS researchers argued that it is the interaction of employees with the computerized information systems in their work contexts that produces observed effects, whether positive such as more productive work practices or negative such as resistance to the new technology systems (Markus 1983). Such an approach has endeavoured to account for agency of both people and technology to better make sense of the social and organisational implications of information systems innovation (Markus and Robey 1988). More recently, a basic consensus has been formed regarding the importance of considering ICT innovation and its effects as resulting from the relationship of the capacity of artefacts to make a difference with the socially embedded capacity of people to act. Attention to technology and human actor relationships is drawn through a variety of concepts, such as actor networks – with technology artefacts assumed actor status – affordances, imbrication, or entanglement (Leonardi et al. 2012; Markus and Silver 2008; Orlikowski 2007). Their ontological and epistemological differences notwithstanding, all these concepts contribute to a view of ICT innovation as a process of interaction of human actors with digital artefacts bearing potential for new socio-material formations.

The significance of this theoretical position is that it discredits universal a priori expectations of specific effects of ICTs, such as efficiency effects of ERP implementation in public sector organizations. It also discredits predictions of outcomes of ICT implementation purely on the basis of people's capacity for shaping of ICT to pursue their desirable goals or for blocking change that does not comply with their values and habits. Socio-technical or socio-material theories of technology posit that ICT innovation does neither impose on people behaviours strictly driven by what ICT artefacts are built to do, nor derive from available technology artefacts any goal people may wish to achieve.

Theories of technology however cannot explain why the human-technology interactions of particular instances of innovation unfold differently and produce different effects in different contexts. For this, IS research draws from theories of action that associate human capacity to act with the social context of action. Here too, two extreme positions are discernible in the IS literature. One view ascribes human actors with the capacity to identify desirable goals and to pursue strategies towards achieving them. For example, managers are expected to draw and follow plans of action, technology development and organizational restructuring to achieve their organization's strategic goals of increased productivity or competitiveness. In contrast, a social structuralist view considers action as being conditioned by the social structures in which human actors are embedded. Individuals act in the way the social roles of their organizational or broader society demands. A synthesis of these theoretical positions is sought in 'structurational' theories, according to which human actors are able to exercise agency in setting desirable objectives and the pursuance of their realization, but this ability is enabled or constrained by their social setting. There are several versions of structurational theories of action which differ, among other things, with regard to the social context they bring to bear to the analysis of the interaction of human action and social structure

relationship when explaining change (Jones and Karsten 2008; Kvasny and Keil 2006; Mingers 2004). For example, theories of situated practice tend to focus on the formation and exercise of agency in the microcosm of specific situations, assuming but not explicitly examining the influences from a broader context that makes the micro situation possible and action within them meaningful (Orlikowski 2000). In contrast, research that draws from critical realism tends to explain ICT innovation and its outcomes with analysis of the organizational setting of action and broader social institutions (Njihia and Merali 2013).

While theories of technology and of action underpin all research on ICT innovation and its socio-economic consequences, research on ICT in developing countries requires also foundational theory that problematizes the notion of 'development', Such theory identifies what is 'development' and provides guidance on interventions aiming to improve the life conditions in poor regions of the world (Avgerou 2008; Heeks 2006; Walsham 2013). The most dominant view of development is economic growth (Mann 2004), which is discernible in the policies of some major international development organizations and initiatives aimed to promote ICT for development (Kirkman et al. 2002; World Bank 1999; World Bank 2000; World Bank 2016). This view has been criticised as ineffective for making a difference to the lives of the poor in developing countries. Alternative theoretical perspectives on development emphasized the importance of interventions for improving such aspects of individuals' lives as health, education, longevity, gender, freedom of expression. While many development theorists have contributed to this debate (Cornia and Stewart 2014), best known and most influential has been the work of Amartya Sen (1999). Sen's theory of development, also known as the 'capabilities approach', focuses on the capacity of individuals to live the lives they have reason to value. The ideas on development by Sen and other critics of the economistic perspective led to the more comprehensive policy direction that has been fostered by the UNDP's 'human development' approach.

Sen's capabilities approach has also become influential in ICT for development research. Many researchers in this field choose to focus on aspects of human development rather than aspects of economic growth or other economic indicators such as business competitiveness. But the invocation of Sen's theory tends to provide a normative justification for a focus on issues such as health, gender, and education. It doesn't provide an analytical basis to studying the role of ICT for development. A notable exception is the effort of Dorothea Kleine to operationalise the capabilities theory in her research on ICT innovation in Chile (Kleine 2013). Kleine sought to combine Sen's notion of development as capabilities with a theory of structurational theory of action that brings into the researcher's attention the social context of a community or country. But ICT for development research rarely draws from knowledge on the processes of implementation of development ideas that is produced in the debates of the field of development studies. It rarely takes into account processes of the global political economy of development (Carmody 2012), more often than not choosing to focus on localised power dynamics and socio-economic conditions. This is a weakness that needs to be addressed by expanding the field's research to include studies that consider the political economy of ICT and development at country, regional and global levels.

Overall, while aware of these three theoretical dimensions of ICT innovation and socio-economic change in developing countries, research in this area does not necessarily manage to form effective combinations of theories of technology, action and development for the explanation of ICT and development phenomena. While most studies avoid technology deterministic positions, they often focus overwhelmingly on the social aspects shaping technology innovation, with little attention to specific technologies and their affordances (Burrell 2016). Research that adopts structurational approaches often fails to associate micro-situations of human-technology interaction with socio-economic conditions of the country

concerned or beyond it in the global context. Development theory tends to be invoked to inform and morally justify goals of development but not to guide analysis of the political economy of ICT innovation.

The call for papers for this special issue invited submissions to consider ICT in relation to development issues and broader societal conditions and processes. Initially, the special issue was aligned to the IFIP 9.4 conference in Jamaica in 2013. We then held a pre-ICIS workshop in December 2013 and a pre ECIS workshop in 2014 to assist in the development of papers prior to submission later in 2014. This resulted in 41 submissions. The final four papers were subject to up to three round of review. Each of the four papers that are included in this volume have invoked development theory to frame relevant research questions on their substantive topics of investigation and convincingly combined aspects of technology and action theory in the crafting of their analysis. All papers, either explicitly or implicitly, take the perspective that ICT innovation results from processes that intertwine what ICT artefacts can do with human ability to associate the capacity of technology with their own circumstances. Also they all assume that socio-technical interactions comprising innovation processes and innovation outcomes are enabled and constrained by socio-material conditions of a country's context. Each of them addresses a specific substantive development topic, namely health care, environmentally sustainable development, and online communities involved in the production of developmental effects.

The first paper in the special issue is by Duclos. He presents an ethnographic study of an eHealth network project. This project connects many hospitals across India and Africa, providing medical teleconsultation and distance learning services. The paper draws on science and technology studies to provide an account for the low utilisation of the network. In doing this Duclos points to the limits of techno centric rationality, the importance of understanding ongoing change, the framing of information systems projects and the highly political nature of development work. What is especially strong is that this paper provides a very rich ethnographic account of a south - south eHealth cooperation. It provides an exemplar (in our opinion) of how to undertake and present in-depth ethnographic research in the limited space of a journal article.

Our second paper, by Rajão and Marcolino, draws on Goffman's symbolic interactionism to analyse the ways in which indigenous Amazonians carefully consider the ways in which they make use of ICT to present themselves to different stakeholders. The paper provides a very good example of a new user of information technology, an Amazon Indian, and how they are attentive to the differing funding criteria of stakeholders. It highlights the ways in which competing priorities for the Acapú Indians have led to them simultaneously presenting themselves as being stewards of the rainforest but also actively recording themselves as being farmers who will deforest their land if they are not compensated. It offers a strong account of the competing priorities and interests that often pertain to development in specific settings, and further, highlights the ways in which financial incentives and narratives around the technology come to enact users in particular ways. The paper thus highlights the knowledability of the Indians and how they are not merely recipients of technology, but actively shape the ongoing development and use of the systems.

The third paper, by Ferguson and Soekjad, explores the tensions that may be present in online communities of activists involved in development related projects. The authors highlight that while these communities benefit from the participation of a variety of stakeholders, their interests often differ and are in conflict. Online communities thus are considered to comprise of new users and present opportunities for new uses of ICT in the development sector, but also represent a new challenge to facilitating collective action amongst development actors.

Ferguson and Soekjad view them as intermediary spaces, spaces where agendas for collective action are negotiated amongst heterogeneous participants. Their case study focuses on an online community that was formed to discuss transportation and infrastructure issues. Its results suggest that online communities not only contribute to develop and share knowledge but may also serve as spaces for agenda setting. The paper thus highlights an intermediary space where development priorities are negotiated at a distance, yet come to shape specific development settings.

The fourth paper, by Findikoglu and Watson-Manheim, presents a case of Turkey´s Health Transformation Program. The authors outline and discuss how health information systems may enable new routines and new forms of interaction between doctors and patients. Their paper investigates the use of a health information system in the practice of community physicians and challenges the developmental evaluation of the system on the basis of statistical indicators. They argue that while these indicators are useful, what is crucial is to also understand the micro level practices and routines that take place in its everyday operation. Their paper develops an interesting research framework to attend to the links between macro, messo and micro levels. Based on the concept of affordances, the authors highlight the tensions highlight the tensions between the differing requirements of those operating at the different levels, and suggest that when the goals and the requirements are not aligned across these levels, this may result in adverse health care provision.

Taken together, the four papers in this volume demonstrate two important strengths of the research in the ICT for development subfield of information systems: the engagement with emerging uses of ICT and new categories of users and in depth analysis of ICT uses in relation to the context of the communities of users. While we hope that such research will continue to produce accounts of situated experiences of people in developing countries, we would like to also suggest the need for research that addresses more strategic questions about ICT and development: How do micro-level achievements scale up to lead to long-lasting developmental changes of the socio-political circumstances of developing countries? How does the ICT innovation capacity of specific user communities of developing countries enable them to improve their position in the political economy of a globalised world? How does their ICT innovation capacity articulate with the dynamics of the relentless ICT driven transformation of industrialised countries?

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