EDITORIAL

ICT in Africa: enabling a better life for all

Shana R. Ponelis[a*] and Marlene A. Holmner[b]

[a]*School of Information Studies, University of Wisconsin-Milwaukee, Milwaukee, WI, USA*
[b]*Department of Information Science, University of Pretoria, Pretoria, South Africa*

Information and communication technology (ICT), encompassing modern technology that is used to aid the electronic capture, processing, storage and dissemination of information, whether in numerical, textual, audio or visual format, is an important driver for social and economic development, global participation and competitiveness, and ultimately growth. With a population of more than 1 billion people Africa represents a significant portion of the world population and ICT is a vital tool to release the creative potential and knowledge embedded in her people. In spite of great strides in terms of socio-economic development, the African continent continues to lag economically advanced nations in its research on the developmental impact of ICT. Whilst African countries are enthusiastically embracing ICT for socio-economic development, mainstream information systems (IS) research remains focused on the issues related to ICT in developed, mature economies in North America and Europe (Roztocki & Weistroffer, 2008). Increasing our understanding of the possibilities and limitations of ICT and how to promote its adoption and use in Africa to the benefit her people is of vital interest to researchers and practitioners alike.

This special issue is about how ICTs are affecting and effecting development in Africa. The situation in Africa is unique in that she has some of the fastest growing countries in the world and at the same time, some of the poorest people living in it. Innovations in ICTs have meant that Africa is leading the world in mobile money and in some countries penetration of mobile phones is above 100%. This special issue on ICT in Africa explores whether ICTs can enable better lives for people in Africa and, if so, how and in what ways. This editorial comprises five sections. In section 1 we provide an overview on the state of ICTs on the African continent. Second, we examine the role of ICT with respect to development. In Section 3 we discuss the

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* Corresponding author. Email: ponelis@uwm.edu

special issue in more detail. In the fourth section we introduce the articles in this volume of the special issue on ICT in Africa followed by a summary of the articles in the last section.

1. Africa rising: a continent of hope
The African continent covers approximately 20% of the global land mass and is home to 15% of the world's population with approximately 1 billion people living in its 55 countries (Elahi, De Beer, Kawooya, Oguamanam & Rizk, 2013). Africa's macroeconomic forecasts continue to be encouraging. In 2013, Africa sustained a growth rate of approximately 4% compared to the 3% of the global economy (African Economic Outlook, 2014). This underlines the continent's resilience to regional and global economic pressures.

The positive macroeconomic indicators can, however, be deceiving. An Afrobarometer survey of 34 countries representing approximately three-quarters of the continent's population (76%), shows that Africa's rapid economic growth is failing to reduce poverty or to improve the lives of ordinary people in many countries on the continent: while economic growth rates in Africa are among the highest on the planet, roughly one in five Africans said they often lack clean water (21%), food (17%) and access to medicine and medical care (20%) to meet their basic needs whilst nearly half of survey respondents reported experiencing occasional shortages (Dulani, Mattes & Logan, 2013). The voices of ordinary African citizens speak cleary of the importance of enabling sustainable livelihoods and the need for further increasing socio-economic well-being on the continent.

Although Africa has a shared history and a geopolitical unity that justifies a shared platform it is at the same time also highly diverse. As the award winning journalist and travel writer, Ryszard Kapuściński, wrote, "[t]he continent is too large to describe. It is a veritable ocean, a separate planet, a varied, immensely rich cosmos. Only with the greatest simplification, for the sake of convenience, can we say 'Africa'" (Foreword to *The Cobra's Heart*). The continent houses 6 of the 10 fastest-growing economies in the world (Chad, the Democratic Republic of Congo, Côte d'Ivoire, Mozambique, Ethiopia and Sierra Leone) but is also home to 14 out of 20 of the world's least competitive economies.

Many African countries are aspiring to become information societies and ultimately, knowledge societies allowing them to participate as equal partners in the global information-based economy (Holmner & Britz, 2013). To ensure this participation African countries have initiated ICT projects to address the lack of connectivity to the internet and other global communication networks (Holmner & Britz, 2011). The International Telecommunication Union (ITU) estimates for 2013 were optimistic. According to *The World in 2013: ICT Facts and Figures*, Africa had an estimated 63% mobile-cellular penetration as of 2013. The report cites the following ICT statistics: 16% of Africans are using the Internet; 7% of African households have Internet access; annual household Internet access growth stands at 27%; less than 10% of wired broadband subscriptions have speeds of 2 Mbps or more; mobile broadband penetration has increased from 2% in 2010 to 11% in 2013.

Unfortunately, despite these promising ICT statistics, African countries still have very low ICT Development Index (IDI) scores. All African countries have either a medium or low ICT Development Index (IDI) (ITU, 2011) with those in North Africa (Algeria, Morocco and Tunisia) and Southern Africa (South Africa, Mauritius and Botswana) having relatively higher scores. According to Abdoulkarim & Rugege (2013) the highest ranked African country is ranked 70th globally (out of 155) and more efforts must be made to ensure that Africa is a more active participant of the

information society. These efforts can be driven by more ICT4D projects on the African continent. The importance of ICT4D projects within Africa can be seen in the following quotation of the Secretary General of the ITU, Dr Hamadoun Touré (2013):

> *ICTs are truly transformational. With the power of technology, we can educate every African citizen, right across the continent. With the power of technology, we can open new opportunities and create new well-paid jobs for our people. With the power of technology, we can deliver healthcare services to every African citizen, even in the remotest villages. And with the power of technology we can empower African women and leverage the fantastic energy and passion of young Africans. This is not just a pipe-dream: this is real.*

Although ICT has an important role to play in enabling a better life for all on the African continent, challenges to the realization thereof remain. ICTs may also further entrench and exacerbate existing power relations. As a result care must be taken to ensure that ICTs are enabling and empowering societies and countries rather than establishing and expanding external economic and political interests.

2. Enabling transformational development with ICTs

In the 1990s and the early 2000s, development-focused ICT research predominantly concentrated on bridging the digital divide through overcoming connectivity and access barriers for more and more of Africa's population by providing connections to the rest of the world to ultimately overcome the so-called 'last mile' challenge. As the penetration of ICTs increased across the African continent in the late 2000s and early 2010s, the focus started to shift to the uptake and impact of these ICTs to transform societies and economies (eTransform Africa, 2012; World Bank, 2012) since enhancing information flows alone is not sufficient to grasp development opportunities. Differentiating factors to effect such transformational development are education and skills (Qureshi, 2014) to allow people to "learn of new production strategies, access market information and resources by keeping in contact with peers and associates" (May *et al*, 2014, p. 18 in Qureshi, 2014, p. 215). A more comprehensive and holistic vision was needed and thus the information society was extended to knowledge societies with the digital divide widening into the more multi-faceted knowledge divide.

Knowledge societies are about the "capabilities to identify, produce, process, transform, disseminate and use information to build and apply knowledge for human development" (UNESCO, 2005, p. 27). The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2005) sees the building of equitable, open and participatory knowledge societies as resting on four key principles, namely, universal access to information in the public domain, freedom of expression, equal access to education, and a respect for cultural and linguistic diversity. To realize these principles UNESCO works towards the attainment of three strategic objectives:

1. To foster digital opportunities and social inclusion enhancing the use of ICTs for capacity building, empowerment, governance and social participation;
2. To strengthen capacities for scientific research, information sharing and cultural creations, performances and exchanges in knowledge societies; and
3. To enhance learning opportunities through access to diversified contents and delivery systems.

There are also significant overlaps between UNESCO's view of knowledge societies and what it takes to achieve such societies and the World Bank's requirements to establish a knowledge economy. According to the World Bank (2009) a knowledge economy rests on four pillars:

1. "An economy that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship.
2. An educated and skilled population that can create, share, and use knowledge well.
3. An efficient innovation system of enterprises, research centers, universities, and other organizations that can utilize the growing global knowledge base, assimilate and adapt it to local needs, and create new technology.
4. Information and communication technologies (ICT) that facilitate the effective communication, dissemination, and processing of information."

Although the emphasis is different between knowledge societies and knowledge economies (community vs. markets, democratic gains vs. economic benefits) these two concepts are not necessarily mutually exclusive and the strategic objectives for fair and equitable knowledge societies and the pillars of a knowledge economy are largely complementary in its support for access to information, educational opportunities, production and consumption of localized content and global and local knowledge sharing. As a result we are no longer concerned simply with the singular and one-directional information society where information is a commodity and technological infrastructure provides access and connectivity, but also with knowledge societies that are plural and multi-faceted with a focus on human capability and capacity building and where knowledge is a key factor in economic growth. Barriers to be overcome are no longer only technological but also educational, cultural and linguistic in nature.

Seeking to explicitly reflect this shift in the field of ICT for development (ICT4D), Heeks (2009) uses the term 'ICT4D 2.0' whilst Pimienta (2009) refers to ICT4HD where the 'H' denotes 'human.' Knowledge, innovation and participation from human actors are key themes in their characterization of this new phase. Neglecting to invest sufficiently in human capacity may result in the 'last mile' challenge becoming the 'lost mile.' (Holmner, Britz & Ponelis, 2010). Whilst connectivity, access and accessibility remain necessary it is no longer sufficient. ICTs are no longer an end in itself but a means to an end. ICT research agendas should reflect this expansion in priorities. Development-related research should report on the uptake and impact of ICTs in addition to access and use. Sustainability, scalability, openness, livelihoods and social and economic well-being for all, both urban and rural dwellers, are growing in importance. Acknowledging the importance of inclusivity and innovation – preferably by the poor (termed per-poor) rather than with the poor (para-poor) or simply for the poor (pro-poor) is vital to enable transformational development. Against this background the next section provides an overview of this special issue.

3. Special issue on ICT for development in Africa
We encouraged submissions of original research papers, as well as practice papers, and especially invited papers from authors based in Africa or papers reporting on empirical research conducted in Africa, so as to provide a platform for voices from and about Africa in order to contribute to an African-centered knowledge space as envisioned by Cooper and Morrell (2014). To this end we wanted to allow this special issue to reflect the diversity of the African continent and we believe that we are able to do so in the first part of this special issue with articles reporting on ICTs in Benin, Ghana, Mozambique, South Africa and Zimbabwe.

Avgerou (2008) distinguishes two areas of literature in the field. The first area is concerned with ICT as a strategic resource to grow the economy. The second area focuses on how ICTs may contribute to improving social services and institutions, for

example, health services and state governance. Articles on this issue cover both of these areas. Building on Walsham and Sahay's (2006) classification of ICT and development literature, Brown and Grant (2010) stated that the "ICT for development" agenda examining the link between ICT and development, and empowerment of marginalized communities is under-researched whilst the "ICT in developing countries" agenda comprising cultural implications and local adaptation is over-researched. Articles in this special issue cover both agendas, that is, ICT for development in developing countries. Although Brown and Grant (2010) consider this conflation potentially problematic, we contend that it is appropriate since using ICT for development in developing countries is arguably more beneficial.

Research from interpretive and critical research traditions encompassing quantitative, qualitative and mixed methods were also encouraged although positivist research was by no means discouraged or excluded. Articles employing quantitative and qualitative methods within positivist and interpretive research paradigms were received. Unfortunately the critical research paradigm remained unexplored as an approach, a shortcoming in the field of ICT research in developing countries already identified in an article in this journal by Walsham and Sahay (2006). Avgerou (2010) also comments on the paucity of literature in the ICT4D field from the perspective of disruptive transformation rather than progressive transformation where ICT-enabled development is considered as "a contested endeavor or as involving action with unequal effects on different categories of population, and thus is laden with conflict" (p. 8). Research using a critical approach focuses on identifying such conflicts, contradictions and power relations and empowering people by eliminating these sources alienation and domination (Oates, 2006, p. 296). The critique of tradition and technological determinism, the emancipatory approach, the non-performative intent and the reflexivity embedded in the critical research paradigm is eminently suited for the study ICT-enabled development in developing countries in general and in Africa in particular.

Another shortcoming identified in ICT-enabled development is the comparative lack of literature that seeks to inform policy on the ways in which ICT can serve broader and more strategic developmental objectives (Walsham, 2013). Several articles in this special issue provide implications for national policy on ICT and related matters to further more strategic developments to expand and improve institutional infrastructure, rather just reporting on specific implementations.

In the next section we provide an extended introduction of the articles in this special issue on "ICT in Africa" highlighting each paper's unique contribution and providing comments on linkage to relevant literature.

4. Articles in the special issue

In the first two papers in this issue Felix Olu Bankole, Kweku-Muata Osei-Bryson and Irwin Brown examine the impact of ICT infrastructure on intra-African trade and seek to inform policy to achieve broader national and regional strategic economic growth that can impact positively on employment creation, amongst others. Within-Africa trade accounts for only 10% of all African trade, which suggests a missed opportunity for economic growth (eTransform Africa, 2012). Given the closer proximity such intra-African trade can reduce transportation costs and the associated environmental impact. Moving away from traditional trade theory, the authors employ a new theoretical framework to explore the impact of telecommunication infrastructure, educational attainment and institutional quality (a term used to describe the quality of national institutions, governmental accountability, corruption

perception, property rights, investor protection, and the rule of law amongst others) on intra-African trade.

In the first paper, "The Impact of Information and Communications Technology Infrastructure and Complementary Factors on Intra-African Trade," structural equation modeling (SEM) with partial least squares (PLS) is used to analyze archival data on 28 African countries sourced from, amongst others, the ITU and the World Bank. Focusing on South Africa as the point of reference the findings suggest that investment in telecommunication infrastructure and institutional quality has a direct impact on trade by facilitating transactions and providing a stable economic and political environment suitable for trade transactions. Furthermore, telecommunication infrastructure investment and levels of educational attainment enhances institutional quality, indicating that an educated citizenry and civil service with access to information resources are beneficial to intra-regional trade relations. Governments and policy-makers should therefore recognize the complementary impacts of the state of telecommunications infrastructure, institutional quality and educational attainment in their countries on trade.

Having shown the significant and positive effect of telecommunication infrastructure and institutional quality on intra-African trade flows, the authors examine the impact thereof on regional trade efficiency in their second paper, "The Impacts of Telecommunications Infrastructure and Institutional Quality on Trade Efficiency in Africa." Again employing SEM PLS followed by data envelopment analysis (DEA) and multivariate adaptive regression splines (MARS), the results of the analysis show that institutional quality will not impact trade efficiency without some level of telecommunication infrastructure investment. However, they note that governments must carefully consider how much investment would yield optimal positive effects on trade efficiencies since a negative effect is likely if telecommunication infrastructure investment is above a certain threshold but the institutional quality is poor. A further implication is that telecommunication infrastructure investment and other development assistance is more effective to support socio-economic development in countries with good institutional quality.

Agriculture is an area of immense importance in Africa given that food supply and security is an area of concern. Furthermore, the agricultural sector employs between 70 and 75 percent of the African workforce and accounts for about a third of the continent's GDP making agricultural development an area for future expansion in Heeks' (2014b) post-Millenium Development Goals agenda for ICT4D. The next two articles examine how ICTs are changing the landscape in the agricultural sectors of Benin, a West African country, and Zimbabwe, a country in Southern Africa, and illustrate the differential support and use of ICTs in these two countries.

In their paper entitled "Taking Profit from the Growing Use of Mobile Phone in Benin: A Contingent Valuation Approach for Market and Quality Information Access" Djalalou-Dine Arinloye, Anita Linnemann, Geoffrey Hagelaar, Ousmane Coulibaly and Onno Omta use a novel application of an existing methodology from the field of environmental economics, contingent valuation, to examine the mobile phone as communication method in the food and agricultural sector in Benin where strong information asymmetry exists (farmers are largely unaware of the current market prices for their products at various markets). Contingent valuation is a survey method that is generally used to place monetary values on services or products for which market prices do not exist or, if they do, do not reflect their social value. The authors are concerned with establishing whether rural and peri-urban pineapple farmers in Benin would be willing to pay for a mobile-based market information service (MIS) supplying them with information on improving the quality of their crop

and market prices in order to reduce the information asymmetry and thereby ensuring that such a service is sustainable financially. Acknowledging the need for suitable infrastructure and the geographic and generational differences, the authors conclude that a mobile-based MIS can contribute significantly to helping rural communities improve their livelihoods by supporting better product quality and facilitating market access and that users are willing to pay up to US$2.50 per month for such a service. According to the authors the challenge for future development and policy-oriented research is to assess how existing infrastructure and the institutional organizations can support such a MIS, which can help farmers to increase yields, manage their land better and increase sales revenues. This echoes the UNDP's (2003) view that overcoming "structural constraints that impede economic growth and human development" (p. 1) is crucial for sustainable human development.

In a study informed by the diffusion of innovation (DoI) theory, Tinashe Mugwisi, Janneke Mostert and Dennis Ocholla discuss how the lack of up-to-date ICTs can negatively affect information access and utilization among researchers and extension workers within the Ministry of Agriculture, Mechanization and Irrigation Development in Zimbabwe in "Access to and Utilization of Information and Communication Technologies by Agricultural Researchers and Extension Workers in Zimbabwe." The authors refer to multiple challenges related to the implementation of ICT initiatives within the agricultural sector which include lack of proper policies, high telecommunication costs, gender bias, and poor telecommunication and electricity infrastructure (Kalusopa, 2005; Kumar, 2005). The researchers found that various ICTs were considered to be effective in the dissemination of agricultural information although the level of effectiveness varied between researcher and extension workers. Mobile phones were considered to be effective to communicate agricultural information amongst the various stakeholders in the sector including the researchers, extension workers, farmers and agri-businesses despite the fact that only 25% of participants could access them from the office suggesting that participants were using their personal mobile phones for work purposes. This could be attributed to the theft and vandalism of telephone and copper cables that has affected the effectiveness of telephones, creating a bigger dependence on mobile phones. At the same time other ICTs such as radio and television, in spite of ready availability, were not considered as effective. Compared to the situation in Benin, Zimbabwe lags significantly in the use of mobile telephony to support its agricultural sector.

Of the world's population 50% lives in rural areas but in Africa this figure is closer to 70%. Although there is significant migration and rapid urbanization, rural development remains a firm development goal (Heeks, 2014a). Ensuring not only information access in rural areas but also the potential to exploit the information in the local context is a vital concern to further the knowledge society and knowledge economy in African countries and to counter social exclusion that may arise in rural areas. With the unprecedented use of mobile telephony the need for shared access is assumed to be diminishing. Coward (2014) postulates that adoption of mobile phones, particularly smartphones, may in fact stimulate demand for computers in shared access settings and that mobile phones and public access venue computers do not substitute for each other but that each is used for a distinct set of activities and information behaviors, associated with different social, academic, or professional practices. As a result innovation that can leverage the increasing ubiquity of mobile phones could drive new uses of shared access centers in low-resource environments. Furthermore, mobile infrastructure in rural areas may not yet exist necessitating alternative means of access. In the two following two articles such alternative means for providing information access in rural areas are examined, one in Mozambique and

one in South Africa, two neighboring countries in Southern Africa.

Sara Vannini, Isabella Rega and Lorenzo Cantoni in "Information and Communication Flows through Community Multimedia Centers: Perspectives from Mozambican Communities" report that these centers (CMCs) are seen as sources of inbound information through the community radio and as a means to share information within the communities' boundaries but not as a means to share information from the community outside of its borders. Using a quali-quantitative content analysis approach the authors analyzed results from 230 semi-structured interviews from 10 CMCs from across Mozambique. CMCs offer a variety of services with more common services being photocopies and basic computer courses. Of the 34 CMCs in the country only 8 (23.5 %) reported Internet access being available although all of them had internet access at inception. Of the 4 in the sample reporting internet access only 2 did in fact have an internet connection available when visited by the researchers. From the interviews the benefits of CMCs are seen to be, amongst others, learning, participation in the local socio-political life, edutainment activities, and being better prepared for a job. Community radios were widely perceived as answering the information and communication needs of the respective communities (60.9% compared to telecenters' 7.4%). The authors posit that the lack of access to (online) content may well contribute to the low satisfaction level with telecenters in terms of inbound and outbound information and communication flow. The authors suggest examining how local communities have reinterpreted the role of CMCs using a social representations perspective since they may be perceived to have a different function, namely as learning and training catalysts. The authors state that funding agencies should take local perspectives and appropriation of ICTs into account to increase sustainability by better embedding these into the social context and increasing community ownership thereof. This reaffirms the importance of social embeddedness as discussed by Avgerou (2010, pp. 4-5) and supports the need for higher levels of inclusivity in innovation. Unfortunately, the authors did not incorporate mobile telephony in their study but they report that no mobile telephone use was observed during their fieldwork. However, they suggest that the influence and impact of mobile telephony on information and communication flows through CMCs be included in future research.

In their article "Evaluating Users' Perceptions of the Digital Doorway: A Narrative Analysis" Braam van der Vyver and Mario Marais examine another means of access for rural communities that purposefully do not offer internet access or any supervisory staff but contain applications such as educational games, content sourced from Wikipedia and Project Gutenberg (predominantly in English), and applications such as Open Office. The purpose of these digital doorways (DD) is to increase computer literacy and associated skills in low-income communities, particularly in rural areas where access to information via computers is limited. Inspired by the Hole-in-the-Wall project in India, the DD is a kiosk with up to four screens or terminals that are designed to be low maintenance and rugged in order to be deployed outside buildings for public access. Using a grounded theory approach to narratives generated during an evaluation 10 years after implementation the authors find that there is a strong need for short-term educational support since DDs are predominantly used for school-related research. Edutainment also featured strongly in the results on usage. Studies to compare the content available on the DDs compared to the communities' expressed information needs are already underway. The presence of mobile phones or the role of mobile telephony is not addressed, although it may be a fair assumption that deep rural areas may not yet have access. Both of these articles

point towards the important role that ICT can play in developing human capacity to support knowledge economies and societies.

As the year 2015 is drawing closer there is a renewed focus on achieving the Millennium Development Goals (MDGs), especially on the African continent (Soe-Lin, Hecht, Schweitzer, Thomas, & Kim, 2014). According to Wertlen (2008) the MDGs brought considerable attention to the ICT field as ICT can play an important role within this development process (Clarke, Wylie, Zomer, 2013; Heeks, 2014a). To help achieve this development in rural areas, Malungelo Mamba and Naomi Isabirye discuss the development of a framework in their article "A framework to guide Development through ICTs in rural areas in South Africa". This framework can help improve the sustainability of ICT4D projects as many efforts to apply ICT as an enabler for development have largely failed (Gichoya, 2006; Harindranath & Sein, 2007, Heeks 2009). The study is a multiple-case case study design where two cases are used to identify causes of failure of ICT4D projects. These causes include: poorly formulated policies, ambiguous requirements, inadequate understanding of the link between ICT and development, inadequate user participation, and poor project management. The two ICT4D cases described is the Alice Regeneration Project (ARP), which is situated in a small rural town in the Amothole District Municipality in the Eastern Cape province of South Africa, and the Siyakhula Living Labs (SLL) project in the Mbashe Municipality. Both projects have been running for several years and the authors had access to individuals who have participated in both projects. From their research a framework is developed designed to help project implementers avoid the above mentioned causes of failure. The framework consists of four factors that are critical for ICT4D success namely: understanding community needs, appropriate technology, project implementation and sustainability. Sustainability of ICT4D projects is a theme that can be traced through many articles in this special issue.

This challenge is also prominent in the article by Sue Conger "Knowledge Management for Information and Communications Technologies for Development Programs in South Africa" who discusses the contribution of Knowledge Management within ICT4D projects. The article discusses one of the living labs in South Africa. The Living Labs in South Africa (LLiSA) is a collective of projects or labs that provide networks, computers and applications for use in remote rural villages. Currently there are six labs active in South Africa and three others in planning stages (Cunningham, Herselman & Cunningham, 2012). So far these labs have exhibited mixed success. Some projects are very successful in training users how to use the internet and smartphones, while other labs fall into disuse. The specific project chosen for this case study is the same case used by Malungelo Mamba and Naomi Isabirye in their article "A framework to guide Development through ICTs in rural areas in South Africa" namely the Siyakhula Living Lab (SLL) project. This lab is used to evaluate the extent to which knowledge management (KM) best practices are applied so as to improve the probability of project success. The author identifies various key requirements for project success: develop a project strategy with long-term and short-term goals; emphasize sustainability; develop committed, enthusiastic competent leaders; attend to cultural differences in gaining trust and cooperation; define a local champion, maintenance and help support staff; develop trust openness, mutual respect and understanding with the locals; balance demand and supply of resources; design appropriate fully working technology that is based on local needs; ensure that all problems are remedied; and manage expectations. As KM research within ICT4D projects is very scarce, this article is a positive addition to the current ICT4D body of knowledge. Future ICT4D projects could benefit from the use of KM to cultivate trust, complement training and improve sustainability.

According to Heeks (2010) there has been limited focus on the contribution of ICTs to development in past ICT4D priorities. This shift in focus to the development contribution of ICT4D is reflected in the paper "Models for Online Computing in Developing Countries: Issues and Deliberations" by Bob Jolliffe, Olav Poppe, Denis Adaletey and Jørn Braa who discuss how a health information system (HIS) in Ghana was realized through the act of improvised outsourcing by hosting the service through online computing. Over the past 20 years the implementation of HIS in Africa has been faced with numerous problems such as exhausted funding, resource poor environments and the unavailability of utilized legacy system source code. Due to the expansion of internet connectivity on the African continent new models of provisioning systems using the web is now possible. The authors investigate the opportunities and challenges of this new model by discussing the new web-based HIS in Ghana. The article is based on participatory action research due to the authors' continued involvement in the implementation of the District Health Information Software 2 (DHIS2) in Ghana. This involvement included the customization of the DHIS2 software for use in Ghana, the training of local implementers and end-users, configuration and maintenance of the servers on which the systems run and discussions with the various stakeholders. This article is a very valuable contribution to the field of ICT4D as it discusses the role of improvisation and outsourcing for long-term sustainability, which can be implemented in other ICT4D projects where sustainability is often a critical success factor. According to Ciborra (1999) improvisation is a grounded process that can be used in situations where traditional methods and rules fail. This is often the situation within Africa where the implementation of information systems and other ICTs are often fraught with challenges, often financial. This article contributes to a lack in academic literature focused on improving success rates for practitioner initiatives (Sahay & Avegrou, 2002; Walsham, Robey & Sahay, 2007; Brown & Grant, 2010).

5. Summary

This special issue on ICT in Africa explores whether ICTs can enable better lives for people in Africa and, if so, how and in what ways. The papers in this first issue of two on ICT in Africa examine the role of ICT infrastructure and institutional quality to enable an increase in intra-African trade, the use of ICT in the agricultural sectors of Benin and Zimbabwe, in particular mobile telephony, to enable information sharing, the use of digital doorways in South Africa and telecenters in Mozambique to enable information access to remote rural areas, the role of improvisation and outsourcing to enable the delivery of health information within Ghana, and ways to improve the use of ICT for rural development to enable increased sustainability and improved livelihoods of people on the rural periphery. In the next special issue on ICT in Africa the focus shifts to explore how ICT can be adopted and used to build better lives for the people of the African continent.

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