Deploying Development Informatics in Bridging the Digital Divide: Challenges & Opportunities

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Abstract

The paper discusses the inextricable link between ICT and development and opines that ‘development informatics’ has the potential to bridge the digital divide in developing countries. Current approaches to bridging the digital divide, particularly in third world countries, have failed to yield the intended outcomes, presumably because technology has been thrust onto communities without being integrated in their socio-cultural and economic milieu. The objectives addressed in this paper are twofold, namely to: demonstrate the inextricable link between ICT and development, and propose a development informatics model for bridging the digital divide.

Keywords: Development informatics, ICT4D, digital divide, economic development, participatory processes

Introduction

Governments the world over are preoccupied with bridging the digital divide because they believe there is a direct correlation between lessening or reducing digital inequalities and economic development (Dutta et al., 2004; World Economic Forum, 2003). In Botswana, for example, the government has promulgated a national ICT framework to drive social, economic, cultural and political transformation (Ministry of Communication Science & Technology, 2007). Development informatics is a new discourse covering a broad range of fields, including but not limited to health informatics, community informatics, social informatics, e-governance (government informatics) and e-learning (Matavire, 2010). Development informatics as a discipline provides new kinds of ICT systems that are socially relevant to remote communities - whether geographically or socially separated - by making life easier for individuals. For this reason, the World Bank (1998) recommended a systematic approach to deploying ICTs to meet the needs of rural communities. Development informatics ensure that before any ICT is deployed in rural communities, the needs and priorities of the people, in agriculture, education, commerce, natural resource management, health, etc., and gaps in the information needs and the actual information available must first be identified. This would make it possible to work out how ICTs can meet and address the community’s information needs.

Development informatics requires ICT solutions to be designed through the joint participation of all stakeholders in order to support the developing society’s economic and socio-cultural wellbeing, and also

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mirror the economic and socio-cultural exigencies and traditions of societies. In the context of this paper, development informatics is used as an all-inclusive term to refer to the application of information and communication technologies (ICTs) to enhance development. In this respect, the concept is used synonymously with Information Communication Technologies for Development (ICT4D). The term ICT4D has been used to mean the application of ICTs within the field of socioeconomic development or international development. Development informatics therefore concerns itself with directly applying information technology approaches to poverty reduction. Well applied, ICTs can benefit disadvantaged persons or aid organisations, non-governmental bodies, governments and businesses, and improve general socio-economic conditions (Sutinen and Tedre, 2010). The link between ICT and development cannot be overstated; Paliwala (2003) notes that the root cause of the global divide is the lack of economic development. Kofi Annan (2001:n,p) also goes on record to say that the new technologies changing our world are extremely powerful tools in aiding development because they create jobs and transform education, health care, commerce and politics, aid in the delivery of humanitarian assistance, and also contribute to peace and security.

However, in order for ICTs to positively transform the lives of people or communities, they must be deployed wisely. Bill Gates suggested that community centres or similar ventures are distractions from real problems of development. He noted that 99 % of the benefits of having access to a PC are gained when the person who sits down to use the technology has been provided with reasonable levels of healthcare and education (The Economist Newspaper and The Economist Group, 2005). According to Goode (2001), in order to use computers as tools for development, they must have relevant applications in the user’s life. This view is shared by Peters (2003), who notes that installing computers and connections in underdeveloped communities is necessary to put ICTs to use for socio-economic development. In Botswana, an e-readiness assessment of SMEs (Mutula, 2008) found that rural communities prioritized government-initiated programmes that would enhance access to anti-retroviral drugs and/or provide information about where people could fetch good market prices or information on how to track lost cattle as opposed to interventions that were aimed at helping people gain access to the Internet or computers. Similar observations have been reported in South Africa where people were found to be more preoccupied with issues of security, shelter, access to clean water, electricity and access to health facilities (Geness, 2004) than consummating ICT for its own sake. This is in sync with Fink and Kenny’s (2004) observation that in many developing countries, people face far more immediate, critical challenges, such as lack of access to water, food, medical treatment and education. Consequently, international aid needs to be directed to addressing basic needs.

In the developing world, especially in Africa, the thirst for socio-economic development to improve the living standards of people is dire, as reflected in some development statistics. For example, Dlamini (2004) observed that poverty in Africa appeared to be on the increase; the continent’s GDP in 2004 accounted for only 1.5 % of global GDP. Likewise Africa’s share of trade during the same year was estimated at 2.1 %. Although Africa epitomizes the challenges of development, other parts of the developing world are also affected. This is based on a statistic that showed that a person in a high-income country was over 22 times more likely to be an Internet user than someone in a low-income country. Secure Internet servers, a rough indicator of electronic commerce, were also over 100 times more common in high-income than in low-income countries. It was found that in high-income countries, mobile phones were 29 times more prevalent and mainline penetration was 21 times that of low-income countries. Relative to income, the cost of Internet access in a low-income country was 150 times the cost of a comparable service in a high-income country. With these statistics, UNCTAD concluded that greater use of technology in business, schools and homes could raise people’s standards of living and prosperity. The Millennium Declaration through the Millennium Development Goals (MDGs) also acknowledges ICTs as essential ingredients for socio-economic transformation and key enablers of poverty reduction. In
the context of Africa, the EU Strategic Partnership goal is in line with the MDGs in promoting the application of and access to ICTs, particularly in health and learning (EU, 2008).

Unpacking the ICT-development nexus

There are various models linking ICT and development from world bodies such as the World Bank, the International Monetary Fund, the United Nations Development Programme, and the World Economic Forum. These models make weak attempts to unpack how ICTs help socio-economic development. A more recent model that gleans from these models, proposed by Maung K. Sein and G. Harindranath (2004), analyses the role of ICT in national development. Their model was intended to correct the frequently held view that ICT is a monolithic or homogeneous “artefact” (Maung K. Sein and G. Harindranath 2004: 17). They argue that seeing ICT simplistically as a development-friendly artefact is an obstacle to understanding “exactly how ICT affects national development” (Maung K. Sein and G. Harindranath 2004: 15). Thus their original contribution was to unpack ICT as a development tool in order to understand it better and improve its chances of success. The S-H model consists of three principal levels, namely how ICT is used, how ICT is viewed, and how ICT impacts on development. Each level has different sub-levels. For example, ‘how ICT is used’ can be broken down into four categories, i.e. “as a commodity”, “as supporting development activity”, “as a driver of the economy”, and “as directed at specific development projects”. As a commodity, “ICT is seen as a product to be used to earn foreign currency through export.” As a support for development activity, ICT helps in activities related to development, e.g. “… planning […] management […] training” (Maung K. Sein and G. Harindranath 2004: 17-18). As a driver of the economy, “ICT is conceptualized to have a macro-level influence (e.g., in infrastructure […] education […] and the private sector.)” (18); and as directed at specific development projects, ICT is “conceptualized as having developmental impact […] within the context of targeted […] initiatives.” (18) (Sein & Harindranath, 2004).

Statement of the problem

The planning and management of ICT projects has had a poor track record, both in developed and developing countries, with the latter performing very poorly (Galliers et al., 1998; Qureshi, 1998; Heeks, 2002; Mgaya, 1999). The causes of failure may be attributed in part to the lack of representation of the target audience; paying little attention to infrastructure, training and technical requirements; deploying complex technologies; inadequate financial resources; and a failure to contextualize ICT to meet specific needs, such as employment. The early application of information technology focused more on tools, techniques and processes rather than on end users. Furthermore, as pointed out by Songan, Ab Habib, Yeo, Gnaniah and Zen (2004), dysfunctional patterns of technology diffusion served to prevent the poor, mostly the rural majority of developing countries, from benefitting from ICTs to the same extent as their educated urbanized compatriots. Through development informatics, it is now possible to integrate contemporary ICT into rural and poor urban communities’ economic lives, thereby raising income levels and improving the overall quality of life.

Andrew and Petkov (2003:76) criticise ICT planning that places too much emphasis on “the end result” and the “hard engineering aspects”. This is exacerbated by the tendency of ICT implementers to “standardize on technology” (Andrew and Petkov, 2003:80) using “off-the-shelf technologies that may not be well-known or tested for a problem at hand”. Andrew and Petkov (2003:86) attribute this error to “the common reductionist tendency” of regarding “the technological subsystem as the whole”. Heeks (2002:103), using the contingency theory, explains that factors influencing the success of a technology project lean toward a “situation-specific” approach. Consequently, whenever a new technology is introduced, there is the danger of a poor fit between the “tool” and the “task”, resulting in what he calls

Determinants that enhance the chances of successful ICT project implementation are multivariate. Green (2000), citing data from the Education Week’s 2000 Teacher Survey, observed that when teachers were asked why they did not use software or the Internet for instruction, they gave some reasons that had nothing to do with access, instead citing lack of software training; the considerable amount of time needed to use technology; the school’s computers being less powerful; the technologies not being aligned with the schools’ curricula; and the difficulty of finding software that meets or addresses students’ needs. Crump and McIroy (2003), discussing a community-based project in Wellington, New Zealand, wondered why when computing was available in a socially situated, convenient environment, at no cost, some people still chose not to compute. Lenhart et al. (2003), in a research project also based in Wellington, New Zealand, on economic and social inclusion, also noted that not all "have nots" necessarily want to be "haves", and not everybody views their engagement with ICTs as a positive force that would improve the quality of their lives. In Northern Ireland (UK), the free provision of computers, fast Internet access and a website to residents/ businesses of Ennis in 1997 to enhance ICT uptake and modernize the region was met with limited success because technology had been thrust onto people without their participation and with little preparation. Training programs had taken place, but they were not sufficiently accompanied by programs that demonstrated why people should use the new technology in the first place.

In some villages in India (New India), the so called knowledge centres situated deep in rural areas meant well in principle to bridge the urban-rural divide. However, it emerged that some of the residents living next to these centres did not even know that they existed and/or what they were all about (The Economist Newspaper and The Economist Group, 2005). This finding is in contrast to the optimism of the 1990s that rural ICTs would leapfrog development, information societies, and a host of other electronic age applications for previously excluded communities. Woherem (1993) noted that software applications that are used in Africa are based on western models and do not take into account local cultural sensitivities. In addition, much of the technology is transplanted without any re-engineering to suit local conditions. Cloate (2007), discussing e-government in Africa, observed that projects have tended to fail because of centralizing the use of technologies by national governments without extending the benefits to intermediary institutions such as local government, parliament, civil society, etc.; in other words not linking good governance to the broader and more inclusive democracy.

**ICT projects, failures & the digital divide**

The United Nations (2005) reported that the spread of information technologies to a select group of people in the world was worsening the disparities between the ‘e-haves’ and the ‘e-have-nots’, thus fuelling the danger that the unequal diffusion of technology, far from fomenting cohesion by providing opportunity, was reinforcing the traditional patterns of economic and social inequalities which could lead to the weakening of social bonds and cultural organisation. During the 2003 World Summit on Information Society (WSIS), Kofi Annan lamented that for too many people, the gains of ICTs remained out of reach. This assertion was corroborated by the International Telecommunication Union (ITU) when it published the ICT Opportunity Index (IOI) in time for the second World Summit of Information Society(SIS) in Tunis in 2005, which generally showed that digital opportunities were unequally distributed between developed and developing countries. Consequently, the gap between the ICT-poorest countries and most others was actually growing. They concluded that the ‘have’ and ‘have-not’ countries were worlds apart (International Telecommunication Union, 2005).
Governments the world over are increasingly promulgating universal access and service policies as key strategies to bridging the digital divide (Mutula, 2008). However, the cases of ICT project failures seem to suggest that focusing on providing access is necessary but not sufficient in bridging the digital divide. Warschauer (2002) made the observation that bridging the digital divide is much more than providing Internet and computer connections, because access to ICT is embedded in a complex array of factors encompassing physical, digital, human and social relationships. Norris (2001) concurs in describing the digital divide as a multidimensional phenomenon encompassing global, social and democratic dimensions. Warschauer (2002) concludes that a social inclusion framework is needed to redirect the focus from providing access to technology, to the effective integration of ICT into communities and institutions for social development. Development informatics is aimed at applying technology for the benefit of all in society. Pitkin (2001) notes that it is important for technology to be designed with the needs of the community that will use it in mind if it is to be useable and accepted. Woherem (1993) points out that unless ICTs are integrated into the cultural milieu of African communities, the people would stand few chances of benefiting and therefore accepting such technologies. The European Commission (2005) likewise observes that the effective use of government services online must start with the involvement of people in the design of e-government applications.

The importance of integrating ICT into the cultural milieu of the people should be considered as a top priority in enhancing development at grassroots level. For example, Masizana-Katongo & Morakanyane (n.d.) point out that rural populations in Botswana were afflicted more with HIV/AIDS because they were victims of the digital divide and therefore lagged behind when it came to information accessibility. Whitacre (2008) describes how several studies have expressed concern that households without ICTs will be at a disadvantage in terms of not only economic development opportunities, but also prospects for communication and social interaction.

This paper therefore addresses two objectives:

1. To demonstrate the inextricable link between ICT and development
2. To propose a ‘Development Informatics Participatory Model’ for bridging the digital divide

The first objective has already been addressed in the preceding sections. The next section focuses on the second objective.

**Development Informatics model for bridging the digital divide**

In literature, customer behavior has been studied mainly from the perspective of technology diffusion, adoption or domestication using diffusion theories to explain different types of users in the context of ‘early adopters’, ‘early majority’, ‘laggards’ and ‘non-adopters’ (Rogers, 1995). Others have relied on the Technology Acceptance model to explain the adoption decisions of consumers (Davis, Bagozzi, & Warshaw, 1989). Emerging technologies that pervade most parts of developing countries, such as mobile phones, now call for a different model to explain diffusion and the adoption dynamics of people, since factors such as culture, values, local norms and customs have been found to have a significant impact on the adoption of mobile services in society (Rafiq & Gao, 2009). A model is a human construct intended to help in the understanding of real world systems as it simplifies assumptions and helps in understanding an abstract phenomena. There are many types of models, but for the purposes of this paper, a conceptual model is seen to demonstrate how people receive information, process it and respond accordingly (MacKay, 2010). Conceptual models are appropriate and desirable to use when introducing a topic as they help learners or interested parties get interactively involved with the creation, evaluation, and refinement of such conceptual models.
The model proposed in this paper (see Table 1) is premised on six pillars, i.e. development, information, technology, community informatics, e-government, and ‘Batho Pele’. Each pillar has several dimensions that indicate the key elements that deserve to be taken into account in the planning and design of ICT projects to ensure the participation of end users. The participation pillar is the foundation of this proposed model and focuses on how to integrate participatory processes with information and communication technologies. The model incorporates the participatory design of information technology resources and popular education by which people are empowered to teach themselves rather than be told by outsiders what they should learn and how they should learn it. Through popular education, people have the power to study their own community and begin to identify local community development issues. They would also identify a set of information issues or the information needed to support specific community development projects.

The Millennium Development Goals (MDGs) are the source of the development pillar. The United Nations Millennium Declaration of 2000 identified eight MDGs for improving the human society. These goals include the eradication of extreme poverty and hunger; the achievement of universal primary education; the promotion of gender equality, empowerment of women; the reduction of child mortality; the improvement of maternal health; combating HIV/AIDS, malaria and other diseases; ensuring environmental sustainability; and developing global partnerships for the attainment of a more peaceful, just and prosperous world (United Nations, 2000). According to Zaidi (2005), economic development is “growth in GDP accompanied by relevant social and institutional changes by which that growth can be sustained”. These changes include reducing absolute poverty, a better quality of life, high literacy levels, improved labour productivity, sophisticated techniques of production, development of physical and commercial infrastructure, higher savings, increase in employment opportunities, a positive attitude towards life and work, and a stable political system.

The information pillar in the proposed model borrows from the Consumer Information Processing model and WSIS manifesto. The Consumer Information Processing model posits that individuals have limitations in the amount of information they can acquire, use and remember. Therefore when imparting information, it is prudent to choose the most important and useful points to communicate, whether orally or in print. Processing, acquiring and evaluating information accordingly is affected by motivation, attention and perception. People should be provided with information that does not require them to expend a lot of energy to obtain, but instead draws their attention and is clear. Furthermore, the amount, location, format, readability and processability of relevant information are important factors in designing information systems tailored to fit the audience (The Communication Initiative Network, 2003). Stoeker (2004) notes that information for development should focus on what kinds of information the community wants in order to implement a particular development, organizing, service, and/or advocacy project.

The final communiqué of the World Summit on Information Society held in Geneva in 2003 made a declaration of the common desire and commitment of the world to build a people-centred, inclusive and development-oriented information society, where everyone could create, access, utilize and share information and knowledge, enabling individuals, communities and peoples to achieve their full potential in promoting their sustainable development and improving their quality of life (WSIS, 2003). The declaration of principles also envisaged spreading the benefits of technology to all in society by connecting villages through ICTs and establishing community access points; connecting universities, colleges, secondary schools and primary schools through ICTs; connecting scientific and research centres through ICTs; connecting public libraries, cultural centres, museums, post offices and archives through ICTs; connecting health centres and hospitals through ICTs; connecting all local and central government departments and establishing websites and email addresses; and adapting all primary and secondary
school curricula to meet the challenges of the information society. Furthermore, it is necessary to ensure that all of the world’s peoples have access to television and radio services, as this would mean that more than half of the world’s inhabitants would have access to ICTs within their reach (WSIS, 2006).

The ICT pillar is derived from the Sein-Harindranath model. This explains the inextricable relationship between ICT and socio-economic development. ICT provides the pipes through which information can be transferred to the community. Furthermore, ICTs provide the means by which information can be gathered and reformulated in tailor-made forms to meet the different needs of individual community members. When properly used, ICT has the potential to empower people to overcome development obstacles, address social problems, and strengthen democratic institutions. The importance of ICT in the implementation of development programmes cannot be overemphasised. Out of the 48 indicators used to benchmark progress towards the MDGs, the last three read thus: 1) To increase the percentage of the population with access to telephone lines and cellular subscribers; 2) To increase the number of personal computers; and 3) To increase the number of Internet users (ITU, 2005).

The community informatics (CI) pillar is borrowed from CI as an emerging discipline that focuses on applying ICTs to enable community processes and the achievement of community objectives. Among the areas of most immediate concern and for which CI is an appropriate response, is overcoming “digital divides” (Gurstein, 1999). The CI pillar facilitates the understanding of development informatics because outside organizational contexts, it focuses on communities, and by and large such communities are believed to mirror the level of development in any given jurisdiction in as far as access to vital resources such as education, health, sanitation facilities, water, infrastructure, and participation in governance is concerned. Through CI, rural communities gain access to local or regional market information for small traders; access information about social and health services; access information that enhances customer-to-customer or community-to-customer (C2C) transactions (e.g. tourism); access information to improve spatio-temporal relations for NGO work; access information on employment in the ICT-sector or jobs requiring ICT skills for family members; access information about legal or policy information; access information to facilitate business to business (B2B) transactions; and access services provided by international NGOs, among others.

The e-government pillar in the model is founded on the notion of a transformative modern government concerned with applying ICTs within public administration to optimise its internal and external functions, [thereby providing] the government, citizen and business with a set of tools that can potentially transform the way in which interactions take place, services are delivered, knowledge is utilised, policies are developed or implemented, and the way citizens participate in public administration reforms (United Nations, 2008). E-government is perceived to be a panacea to the deficiencies of traditional forms of government where citizens physically go to government offices to apply for passports, birth certificates or death certificates, or file tax returns, with the attendant delays that arise out of long queues, lost files or the absence of relevant officials (United Nations Department of Economic Affairs, 2006).

The ‘Batho Pele’ pillar is derived from the South African e-government’s brand name which translates in English to mean ‘people first’. Batho Pele consists of a number of principles which are considered to be a good policy and legislative framework for service delivery in the public sector in South Africa. These principles include (Department of Public Service and Administration, 1996) consultation (engaging with customers in terms of what they want); service standards (continually improving services); access (enabling disadvantaged persons to access services, speaking in understandable languages, etc.); courtesy (being polite, courteous and friendly to customers); information (reaching all customers to make sure they are well informed about the services government departments provide); openness and transparency (being open and honest about every aspect of work by publishing annual reports to tell citizens how resources
were used, how much everything costs, including costs for staff, equipment delivery, services, etc.; redress or dealing with complaints (providing a mechanism for customers to record when they are unhappy with a service, etc.); and best value (giving customers the best service using all the available resources; eliminating waste, fraud and corruption; and finding new ways to improve services at little or no cost).

The proposed Development Informatics model is summarized in Table 1 below:

**Table 1: Pillars & Dimensions of Proposed Development Informatics Model**

<table>
<thead>
<tr>
<th>No</th>
<th>Pillar name</th>
<th>Dimensions</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development</td>
<td>Eradicating poverty; gender equality, empowering women; improving people’s health; combating diseases; environmental sustainability; better quality of life; high literacy levels; good physical and commercial infrastructure; a democratic political system</td>
<td>MDGs, WSIS,</td>
</tr>
<tr>
<td>2</td>
<td>Information</td>
<td>Useable information, effective communication channels, information accessibility, information integrity, information currency, appropriate format, relevant information, readability, custom-made information systems, development-oriented information, local content, linguistic diversity, multiculturalism</td>
<td>WSIS, Information Processing Model,</td>
</tr>
<tr>
<td>3</td>
<td>Technology</td>
<td>e-inclusion, information reformatting digital literacy, digital divide, digital dividends, universal access, universal service, appropriate technologies, mobile phone penetration</td>
<td>WSIS, ITU, Sein-Harindrana</td>
</tr>
<tr>
<td>4</td>
<td>Community informatics</td>
<td>Community processes; community objectives; access to health, sanitation facilities, water, infrastructure; participation in governance; access to information on SMEs; information on employment, legal or policy information; NGOs services</td>
<td>Community Informatics</td>
</tr>
<tr>
<td>6</td>
<td>Batho Pele</td>
<td>Consultation, service standards, access, courtesy, availing information to all, openness and</td>
<td>South African e-government Batho</td>
</tr>
</tbody>
</table>
transparency, system of redress, best service value, reducing fraud and corruption, new ways to improve services, affordable service costs

Pele principles

Development informatics in bridging the digital divide

Development informatics draws its relevance from how it is applicable to all levels of society and enhancing digital inclusion. The EU for example, conceived the idea of e-inclusion to refer to employing modern ICT technologies to address issues of the access divide and promote opportunities for the economic and social empowerment of all global citizens (United Nations, 2005). E-inclusion envisages a future in which all people have access to social and economic opportunities and can use technology. In this context, the WSIS (2003) noted that the digital revolution, spurred on by the engines of ICTs, had fundamentally brought about new ways of; among other things, conducting economic and business practices, running government, engaging politically, providing the speedy delivery of humanitarian aid and healthcare, and improving the living standards of millions of people around the world. In an article entitled “Mobiles narrow digital divisions”, BBC News (2008) noted that mobile phone and net access were helping narrow the gulf between rich and poor nations. The efficiencies these technologies brought had boosted development in poorer countries. In Africa, where the increase in terms of the number of mobile phone subscribers and penetration has been greatest, the economic life of most people has improved. For example access to mobile phones by rural communities in Uganda and the small vendors in South Africa, Senegal and Kenya has helped traders get better prices, ensured that less went to waste, and improved the speed of transactions.

In India, an ICT health pilot application in Rajasthan successfully empowered village healthcare workers, burdened by demanding data-collection and paperwork responsibilities, to provide timely healthcare information. This problem was addressed by substituting manual registers with client data stored on hand-held computers which can be accessed through a variety of icons. Another project in agriculture used IT-based machines at milk collection centres to measure the butter/fat content of milk, test the quality of the milk, and make prompt payments to farmers. This significantly reduced incentives to cut the milk by adding water and reduced the time for payments from 10 days to less than five minutes, thus instilling confidence in farmers in the cooperative set up (Subash Bhatnagar and Robert Schware, 2000). Also in India and with respect to good governance, the Computer-aided Administration of Registration Department (CARD) was implemented by the Government of Andhra Pradesh (AP) to improve the efficiency of its administrative offices and to become more responsive to its citizenry. Other success projects include the Honey-Bee Knowledge Network, which was implemented to augment grassroots inventors and overcome language, literacy, and localism barriers; the Warana Wired Village Project, designed to provide agricultural, medical and educational information to villagers through networked booths in the villages; and adapting and using ICT to enhance functional capacity and improve the employment potential of disabled people by using speech synthesisers and ‘talking computers’ (Subash Bhatnagar and Robert Schware, 2000). Similarly in Indonesia, mobile networks have helped connect a population dispersed over 17,000 islands, while in Pakistan, mobile technologies have been used to benefit low-income communities by offering them a chance to connect to the wider world, as some of them experienced during the earthquake in October 2010 (Gao & Rafiq, 2009).

Heeks & Kanashiro (2009) found in Peru that people living in mountain regions who suffered social, political and economic exclusion used ICTs to enable new and positive resource flows to teenage students and young farmers. The ICT that was deployed is presently used to maintain social networks and support
information searches that have improved agricultural practice. Through ICTs, remittance payments are facilitated, health and online information is made available, tourism is enhanced, and there are improved sales of agricultural produce to external markets (Lightfoot, Gillman, Schueurmeier, & Nyimbo, 2008).

The South African Vodacom cellular phone service provider deployed more than 90 000 community-service telephones to under serviced areas where they have become invaluable sources of entrepreneurial activity for hundreds of community phone-shop operators. Since its launch in 1994, the Community Phone Shop concept has expanded into that of communication centres, allowing entrepreneurs, job seekers and schoolchildren access to essential business communication services such as faxes, e-mail and the Internet daily (Department of Communications, 2008:116). Such multipurpose community centres are enabling people to gather information and create, learn, and communicate with others while developing essential skills (Benjamin, 2000). South Africa has about 355 multipurpose community centres (including cyber labs in schools with ICT equipment to enable Internet access and provide multimedia services) that provide ICT services, particularly to rural areas (Farelo and Morris, 2002).

The Independent Electoral Commission (IEC) of South Africa has on three occasions since its first multiparty election in 1994, leveraged ICT to promote free and fair elections. In 2004, for example, IEC, in partnership with cell phone service providers, enabled voters to Short Message Service (SMS) their identity number, and in return receive a message back indicating their eligibility to vote and the voting station’s details. Moreover, a satellite-enabled network made it possible for the commission to register voters; relay, collect and verify ballots; and relay results across the country. The tabulation database system was also linked via a wide area network (WAN) to all district collation centres (Coleman, n.d.). Custom-designed handheld scanners captured information from bar-coded ID books and greatly streamlined the process of voter registration. A more recent e-government project is the South African Revenue Services’ (SARS) e-filing system, which provides a way to conduct transactions related to tax returns on the Internet between government and business (G2B).

The South African government also successfully deployed the National Traffic Information System (eNaTIS), which is used for applications for driving licenses and the registration and licensing of motor vehicles; notification of change of ownership or sale of motor vehicles; and applications for learner’s licenses. The transactions and services can be provided by most transport offices across the nine provinces in the country (National Traffic Information System, 2008). During the first six months of 2008, more than 75 million transactions were performed on eNaTIS. With the exception of routine maintenance outside of business hours, downtime was virtually non-existent in the first half of the year, and phenomenal system processing time was experienced. The eNaTIS processed 96% of all transactions in less than two seconds, 99.8 % in less than 10 seconds, and 99.95 % in less than 60 seconds. Before e-NATIS was launched on 12 April 2007, its predecessor (Natis) managed an average of 300 000 transactions a day. Now, the average rate of daily transactions is 600 000 (Segar, 2008).

In Botswana, the government has extended telecommunications services to most villages in rural districts covering the Central, North West, Chobe, Ghanzi, and Kgalagadi Districts of the country (Botswana Guardian, 2009) The project, known as Nteletsa II, is part of the government’s telecommunications development programme which seeks to extend telecommunications services to all rural areas of the country. Nteletsa is a Setswana word which means ‘call me’. The government, through the local telecom operator, launched Nteletsa II to provide mobile services capable of delivering the Internet, voice and data. One of the key objectives of the project was to provide a shared telecentre in each village with telephone lines and Internet access operated by the national telecom operator in partnership with local communities as a means of empowerment. The telecentres provide other basic services such as charging mobile phones, desktop services, photocopying, scanning and printing. The government also introduced
the bolus system (a chip is inserted into an animal and monitored through a centralised computer system) as a compliance measure to European Union regulations for accepting Botswana beef exports to its member countries. This followed several incidences of foot and mouth disease in Botswana. The bolus system tracks cattle from the farm to the slaughterhouse. The purpose of the bolus system is to improve the identification of respective animals, thereby reducing illegal trade and livestock theft (Kalusopa, 2009).

Nelson (2009), in the context of the Philippines, says teachers use mobile phones to receive videos delivered over school-based televisions via satellite. An anti-corruption website with an online portal also helps in reporting cases (of corruption). Cases are investigated and thereafter names of all public officials who have been convicted of corruption are published to shame them. The website also focuses on a network of community-owned rural Internet kiosks through which government records can be accessed. The website includes recognition of community involvement in both maintaining the sustainability of Internet access and in advising on content available in e-governance solutions. With respect to health, mobile phones and ICT are applied to improve health outcomes by monitoring various websites that ask for feedback via text messaging and through the generation of reports.

In the context of e-government, some countries have made good progress in implementing e-governance systems that are tailor-made to suit various citizen needs. For example, the Singaporean government portal provides information services on culture, recreation, sports, defence and security, education, employment, family, community development, health and the environment. The portal also includes user-centric hot links such as “give us your feedback on national issues and policies” (Government of Singapore, 2004). The Canadian e-government portal, on the other hand, enables public participation that allows individuals to share their opinions on specified subjects, or to participate in various activities (Government of Canada, 2006).

Conclusion

This paper has demonstrated the inextricable link between ICTs and development; provided examples of the practical application of development informatics; and proposed a Development Informatics Participatory model for bridging the digital divide. The author has adduced that current approaches to bridging the digital divide have not led to desired outcomes because technology is not integrated in the social and economic milieu of the targeted communities. The author has argued that a model based on development informatics would provide a solid framework through which technology is designed and implemented to support people and their activities, thus enhancing e-inclusion. The author acknowledges that development informatics alone will not be enough to address the intricacies of bridging the digital divide in developing countries without addressing the conventional challenges that already afflict developing countries, such as poor ICT infrastructure, poverty, limited ICT skills, inadequate resources, etc.

The prospect of using the Development Informatics model proposed in this paper in attempting to bridge the digital divide, especially in developing countries, will not be without challenges. Development informatics is an emerging field; certain challenges need to be anticipated so that appropriate interventions can be designed. Matavire (2010) observes that development informatics is a dynamic, complex, morally challenging and altruistic area. Among the greatest threats of new technologies, is that they have the potential to perpetuate and expand existing power relations and inequalities. From the perspective of e-commerce, growth in this area remains slow as citizens have yet to trust the electronic environment because issues of transactional security, privacy and data integrity are yet to be addressed. The challenge related to limited awareness and ICT skills affects the realization of the benefits of
development informatics. Without an educated, ICT-aware populace, no community can fully participate in the networked world. The serious shortage of ICT skills in developing countries must also be addressed in deploying technologies so that adequate capacity is developed to manage, integrate and sustain them. To empower communities to respond to and avoid these threats, development informatics must enable and function in a fully democratic process.

Finally, development informatics as an emerging discourse needs to be continuously researched to make it more effective as an alternative in addressing the perennial challenges of bridging the digital divide in developing countries. The 4th International Development Informatics Association Conference identified ICT failures and successes (Matavire, 2010) as a topic of interest. Research should also extend to cover non-discriminatory systems for creating, disseminating, using and re-using information, and managing information for the common good. The use of mobile technology in the delivery and management of healthcare services for the poor in society needs greater attention, especially in line with the MDGs. As most countries increasingly implement and disperse ICT to their citizenry, the uptake and use of such technology needs to be assessed to determine the impact it has brought with socio-economic development. Indicators for measuring the uptake of technology need to be researched further, especially in the context of developing countries where there is a paucity of local content and limited broadband access.

References


Electronic Library, 26(4), 468-489