An innovative ICT solution to steer rural communities to global understanding:
a case study from Durban, South Africa

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Abstract

Rural areas surrounding Durban in kwaZulu-Natal, South Africa are characterized by little or no municipal services and fragmented service delivery by other spheres of government. Communities living here typically suffer from high levels of poverty and disease, low levels of economic opportunities and sustainable income, with a real potential to erode key natural asset resources.

This paper presents a case study in the harnessing of innovative ICT in order to provide an enabling environment for members of these communities to become part of the global information society. It outlines the proactive and outreaching role of public libraries in collaborative initiatives with other local institutions in developing digital competencies and providing online information. Informal lifelong education as well as formal curriculum education is targeted.

Self-contained robust multi-terminal computer units are deployed at central points in remote rural areas with free unlimited access to all members of the community. Content on the aptly named Digital Doorway units includes the OpenOffice suite, educational games and programs, interactive science simulations, and a snapshot of the Wikipedia. Health and education curriculum material are continuously updated through a satellite receiver. Small community libraries housed in refurbished shipping containers complement the Digital Doorway units. Together the compact digital library and the container library provide one-stop information shops to remote rural communities. The integrated library service targets learners and tertiary students, focussing on reader education and digital literacy.

Keywords: computer literacy, digital library, global information society, information and communication technology, ICT solutions, rural communities, social development

1. Introduction

There is a growing need for information and communication technologies (ICTs) and media literacy in the daily lives of people so as to revolutionise work and leisure and change business practices (Averweg and Greyling, 2008). ICTs encompass all technologies that facilitate the processing and transfer of information and communication (United Nations, 2002). With a shift in ICTs, a new form of literacy is emerging: computer literacy or media literacy (Livingstone, 2004). With the growing importance of ICT and media in society, media literacy can be seen to serve three key purposes, contributing to:

- democracy, participation and active citizenship;
- the knowledge economy, competitiveness and choice; and
- life-long learning, cultural expression and personal fulfilment (Livingstone, Van Couvering, and Thumim, 2004).

Rural areas around Durban, South Africa, fall beyond the urban perimeter or sustainability line (eThekwini Area Based Management, 2005) and are largely defined by their geospatial features and physical characteristics. These areas account for approximately 67% of the city's spatial footprint, translating into 1500 square kilometers and carrying a population of around 750,000. People live in dispersed settlements in traditional dwelling structures on communal lands along the periphery of the eThekwini Municipal Area (EMA). In spite of accelerated service delivery by the municipality, these rural areas are still characterized by little or no municipal services and fragmented service delivery by other spheres of government. Communities living here typically suffer from high levels of poverty and disease, low levels of sustainable income and few economic opportunities.

Extreme topography in the region restricts access to a few arterial roads scattered over large areas. Inferior roads and inadequate transport infrastructure make it difficult for poor people to access services if these are located far away from where they live (Davids, et al., 2005). Rural areas in the EMA contain few social, physical or economic support amenities; people have access to neither library and information services nor public ICT facilities such as computers, Internet or e-mail; they are starved for information of all kinds.

This paper presents a case study in the harnessing of innovative ICT in order to provide an enabling environment for members of underprivileged communities to become part of the global information society. It outlines the proactive and outreaching role of public libraries in collaborative initiatives with other local institutions in developing digital competencies and in providing online knowledge to all sectors of the community. A methodology for sustainable preservation, dissemination and sharing of local and global knowledge is developed. The "availability of better information helps to improve people's education, health services and general knowledge life-long learning" (Lesame, 2005). "Combining their indigenous communications

2. Digital Doorway and the Meraka Institute

2.1 Background

The Digital Doorway is a joint national initiative between the Department of Science and Technology (DST) and the Meraka Institute, managed by the Council for Scientific and Industrial Research (CSIR). The Institute supports regional initiatives under the New Partnership for Africa's Development (NEPAD), collaborating with ICT organisations through cooperative programmes. It aims to introduce computer literacy and the associated skills into the ambit and experience of all South Africans (Meraka Institute, 2005). In South Africa there are still almost 7.5 million illiterate adults, whilst only 23% of the country's 30,000 schools have one or more computers. School or public libraries in remote rural areas are virtually non-existent. For people living in these areas there is no flow of information and no opportunity to become part of the global information highway. "This national project will give communities in rural and peri-urban areas the opportunity to become computer literate and to access information" (Mangena, 2007).

Originally modelled on the Hole-in-the-Wall project developed by Professor Sugata Mitra of the National Institute for Information Technology (NIIT) in India, the Digital Doorway underwrites the concept of Minimally Invasive Education (MIE) as a form of education (Mitra, 1999). In initial experiments carried out in a village in West Bengal, India, a few computers were installed at a school and children allowed to use them after minimal instructions (Zielenziger, 1995). Results proving that unsupervised use of computers can lead to accelerated learning of skills in children encouraged Mitra to launch his project in New Delhi's biggest slum area in early 1999. A kiosk housing a high-speed touch-screen computer was embedded into a wall, with open access from the street, for any passer-by to use. Results were astounding within hours children had mastered navigating the Internet and learnt to download and play audio and video. Very quickly they moved on to learn some English from English-language websites and to read Indian newspapers (Orvis, 2006). This principle of people's inherent cognitive ability to teach themselves computer skills with minimal external intervention forms the basis of the Digital Doorway.

Whilst the Indian model relies heavily on the Internet for the transfer of information, the local Digital Doorway project focuses on the provision of educational and life skills material and both local and global information in an environment where Internet is not yet available. Digital skills development is achieved in an informal way through use of Open Source software. The multi-kiosk model of the Digital Doorway encourages social and peer interaction of users, dispersing skills and information more efficiently.

2.2   The Digital Doorway kiosk

The robust, vandal-proof, multi-terminal kiosk has a modular design which allows easy configuration and assembly, and follows international best practice in terms of ergonomics (Smith, 2007). Each Digital Doorway is equipped with a server, two fat clients, and a Mindset satellite receiver. A GPRS backhaul connection (mobile communications technology designed for transmission of data) facilitates updating of content, real-time monitoring and user feedback. The original Windows-based configuration has been upgraded to improved, open-access-based software, for reasons of cost saving and absence of licence agreements. CSIR are doing software configuration in-house as needed (Madlala, 2006). Remote management and administration are done using OSS. The file server runs on FreeBSD and the user PCs work on Mandrake with KDE.

The Digital Doorway serves both as a tool for computer literacy development and as a digital library/information centre, covering a range of subjects. Programme content includes the OpenOffice suite, educational games and programmes, interactive science simulations, Maths editor, Celestia Solar System, Kalzium Periodic Table, Tux Paint, Ktouch for touch typing, Draw, Scribus Desktop Publishing and much more. On the Information Resources menu one finds snapshots of the Wikipedia and Project Gutenberg, information packages on computers, crafts, agriculture, health and safety, literature, small businesses, accounting, budgeting, financial literacy, and numeracy. PDF files on employment and finding work, empowerment and governance, the constitution, electronics, conservation, electricity and magnetism, physics and numerous other applications focus on life skills development. The satellite receiver transmits current health and curriculum material free to the general public through the Mindset DSTV television channel. Mindset Network is a South African NGO distributing quality health and educational materials on a mass scale in South Africa and fifteen other African countries (Mindset, 2006). Users are able to create personal accounts on the Digital Doorway in which they can save documents and a USB port allows transfer of documents to a flash drive for later printing.

Latest developments include the clustering of additional units which allows communication with other users at sites that are locally connected through a wireless mesh network. Users are introduced to applications such as Chat programs, e-mail and voice-over IP. Within clusters full access is gained to Mindset through a normal PC only, relinquishing the additional satellite receivers.

3.   Digital Doorways in the greater Durban area

3.1   Background
Faced with the vastness, extreme topography and other physiographic limitations of the rural regions within their newly demarcated boundaries, the

people's inherent cognitive ability to teach themselves computer skills with minimal external intervention. For this to happen, computers must be easily accessible to potential learners in an environment conducive to experimentation.

In order to ensure that a Digital Doorway installation in a community was feasible a number of site related requirements needed to be considered. The Library Systems Department approached the Social Development Department of the ABM to jointly drive Digital Doorway programme in EMA. Their knowledge of regional municipal infrastructure would inform decisions on the geographic placement of the Digital Doorway units. Furthermore their relationship with rural community structures would enable the Libraries Department to obtain the necessary community approval to guarantee successful implementation. Collaboration between the departments involved information sessions with the community, site inspections to assess possible sites that would meet Meraka's requirements for successful installation and implementation of kiosks, and liaison with the Meraka Institute and their subsidiaries.

3.3   Selection of sites

A series of site inspections were carried out to select the most suitable sites for installation. Both physical and community requirements were considered. Technical specifications required a concrete floor onto which the kiosk can be bolted, a non-leaking roof overhang of at least 300 mm and a stable, continuous power supply. Solar power would be considered at suitable sites where there is no electricity. Sites should have cell phone coverage and should not be obscured by trees or buildings. Exact locations were confirmed using a GPS receiver. Approximate distances from close-by schools were established as well as the number of learners at each school. Information gathered at site inspections together with photographs, a site plan and written motivations for a Digital Doorway in the particular communities at the selected sites, were compiled into individual reports for each site and submitted to the Meraka Institute for approval.

At local municipal service nodes the recently established regional customer care centres or Sizakala Centres, as they are locally known, were the obvious choice to install Digital Doorway kiosks in three of the areas. The selection of these locations was based on centrality and accessibility and an already existing accumulation of activities. Steady pedestrian traffic occurs at Sizakala centres where people pay monthly electricity accounts, or visit the health clinics or tribal courts; in addition there are many schools in close proximity. In the kwaXimba area a kiosk would serve 10,000 people, in Ntshongweni 20,000 and in Umbumbulu 65,000 people. In the Mzinyathi area with 20,000 inhabitants it was decided to put a kiosk at the site of the newly built community

hall which is a collection point for monthly pensions and grants; it is also next door to the existing health clinic and tribal court and there are many schools in close proximity.

A further consideration was the container libraries that were planned for all four these locations. A public library at the same site would encourage pedestrian traffic to the Digital Doorways. A Digital Doorway kiosk would also complement a basic library service significantly, particularly in these remote areas where there is no IT infrastructure to connect to the Council network. The planned container library would have no access to the online municipal library catalogue, any subscription databases or the Internet. It was felt that the whole community, young and old, stood to benefit from Digital Doorway kiosks at such central points, with potential exposure of all levels of the immediate surrounding communities to a modern digital library service.

3.5 Community requirements

Active community involvement was encouraged through agreements with traditional leaders. The community as a whole had to express their desire to have the Digital Doorway in their community to ensure buy-in and to prevent vandalism and theft. To introduce the Digital Doorway, presentations were held at ward meetings and schools in the four communities. Information leaflets and bookmarks were distributed. Presentations and information leaflets were done in both English and isiZulu, the vernacular of the rural population. The proposed sites should be at central points, considering that the vast majority of people have no transport. They should be in close proximity to several schools and in an environment that permits children to make a noise (as a yardstick the noise of about twenty kids all competing to be heard was used). The site should also be safe and secure to use at all hours. Additional information sessions with community leaders addressed issues of responsibility, security and maintenance. Volunteers had to be identified to act as champions to monitor the functioning of the unit. It was essential that someone from the community accepts responsibility for the kiosk. This entails restarting the unit if necessary, contacting the help desk for support and maintenance, and keeping the Digital Doorway environment clean. Ward councillors committed themselves and their communities through written agreements to support the kiosks. Champions were trained by Meraka, with basic instructions of how to care for the units.

3.6 Deployment of the Digital Doorway units

Units were transported by road from Pretoria to Durban over a distance of 650 kilometres, where they were assembled on site. Installation could be completed within a few hours except for some sites where logistical challenges delayed full commission of the units. Phase 2 of the project comprised the

clustering of additional units to enable communication with other users at sites that are locally connected through a wireless mesh network. Topography at the Ntshongweni site proved to be excellently suited to roll out the added technology. Several schools are in close proximity to the Sizakala Centre, two of which are in direct line of sight, whilst the other two schools in the cluster were linked through a repeater satellite dish. The four schools identified to pilot this phase of the project were visited and introduced to the concept. Because the same community and site requirements applied as for the units installed at the customer care centres, a similar procedure had to be followed with information sessions, procuring the buy-in of the school masters. Site assessments in conjunction with schoolmasters had to take into account the position of existing power points, potential noise levels outside classrooms or offices and unrestricted access to teachers and learners of all levels at all times. Protection from the weather at otherwise suitable locations on the school premises proved to be quite a challenge, because there was no funding for providing suitable infrastructure such as even extending an overhang or building a retaining wall.

Not one of the selected schools has even a rudimentary media/resource centre. The cluster technology is useful to bridge this gap in educational resources and to make up for a shortage of textbooks. Curriculum material is constantly being updated through the Mindset satellite receiver and lessons are available to teachers and students alike. Furthermore users are introduced to applications such as Chat programs, e-mail and voice-over IP which are not available at stand-alone units. Whilst the technology does not facilitate global coverage, people can contact each other electronically between schools and between the Sizakala Centre and the schools. In an informal way learners skill themselves to use electronic communication media, which translates into potential economic empowerment.

In September 2007 the national launch of Phase 2 of the Digital Doorway project was hosted at Ntshongweni, with the Minister of Science and Technology and dignitaries from the provincial and local governments in attendance. The community expressed their gratitude with song and dance at the festive occasion at which the official logo for the project was also launched.

4. Digital Doorway user statistics

User statistics collected by Meraka show some interesting trends at a national level. The kiosk is mostly used by people in the age group 10-26 years. Usage is strongly male dominated, with four times more male users than female users. While people from various indigenous language groups are using the kiosk, 80% of them indicated that they prefer English on the kiosk. The most popular content on the Digital Doorway is the videos and games. Also very well used are Mindset, agriculture and health information, science simulations

and the Wikipedia.

**Figure 1: Digital Doorway user age statistics**
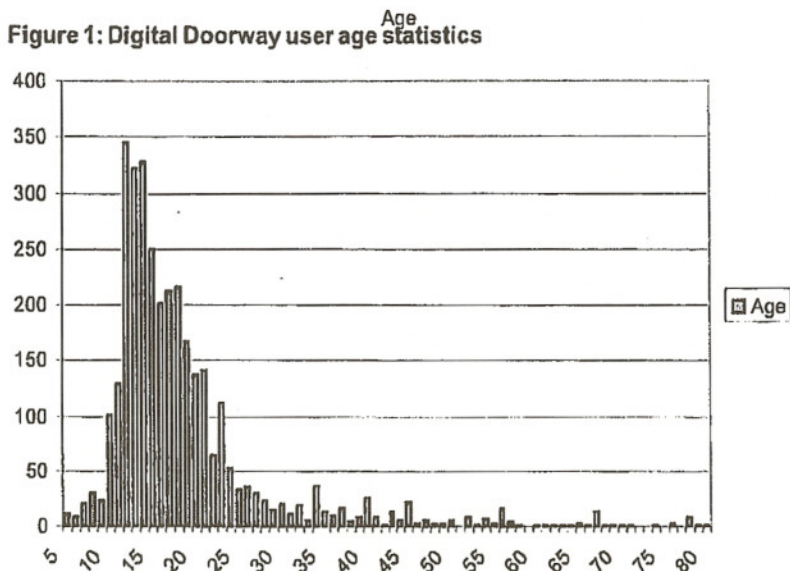
User feedback is overwhelmingly positive. Comments that Meraka received include the following:

- Natasha Nchangacer, a student at the Albini High School for Girls in the Ntshongweni cluster writes that she is enjoying the computer and has learnt much from it. Like many other users she is asking for more games, videos and Internet access.
- Zama Zakwe tells how much he is enjoying the Digital Doorway computers and adds ". . .i wish you could add more brain teasing games if it's possible . . . and the doorway computers help me in my school work."
- Podile Lebogang writes "I would like to express my appriciation for the contribution that these DDWs are bringing to the rural communities, mostly the poor people who do not have access to computer".
- Pitros says "I am using digital doorway for playing games, writing my homework on it sometimes rearranging my staff on it and it so cool because I'm enjoying it a lot, it can be improved by simply having more of them in our areas because we have to walk a long distance to get to use them".
- Tom Kakoma asks ". . . I would like you to install some more

electronic books on this computer or may I say advancet Electronics not only for beginners".

Figure 2: Digital Doorway content usage statistics
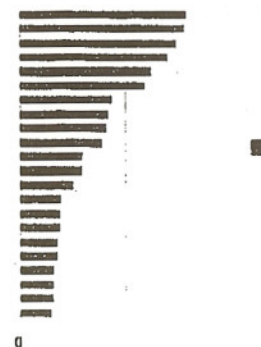
These initial results suggest improved computer awareness, customised content and applications addressing community needs; promotion of computer literacy without external resources; and transferring of knowledge in the community.

5. Container Libraries

In a second joint project between EML and the Social Development Department of the Rural ABM, running parallel with the Digital Doorway project, the provision of a basic library service to the information starved rural communities was pursued. Although being developed as a separate project with an own identity, the realisation by both departments of the commonality in vision and goals of the two projects paved the way for further collaboration.

The ABM provided capital funding, partially from municipal sources and partially from the European Union Development Fund. They procured a contract with a local emerging contractor to refurbish-second-hand twelve-metre shipping containers according to specifications set by the Libraries Department. At two of the sites a second container is deployed as an economic resource centre. The container libraries are fitted with 90 running metres of shelving, a display unit/ magazine rack, issue desk, windows for natural lighting, air-conditioner, electricity and electrical lights. Windows and doors are fitted with burglar guards and security gates. A stand-alone PC and printer for public use will be installed as well as a photocopier. The containers are

furnished with aluminium awnings with a two-metre overhang and they are placed on a paved area where outside seating with tables and chairs are provided. At all sites ramps for disabled people were added. The second container has additional shelving space and a small office for use by business consultants who will provide a volunteer service to the local community.

EML is providing books, staff and operational costs. Books are processed at the Library's Technical Services Department and are recorded in the online library catalogue even though libraries operate manually. People from the local community who work in the city can gain access to their own rural library collection through the online catalogue at one of the city libraries or via the Internet. Currently it is not cost-effective to link facilities in these remote areas to the council network infrastructure which is still running on fibre optic and diginet lines. Staff are employed from the immediate community and trained at the closest established library. Library management oversees administration of the integrated service and provides direction and leadership.

Together the Digital Doorway kiosks and the container libraries provide one-stop information shops for remote rural communities. The integrated library service targets learners and tertiary students, focussing on reader education and digital literacy. An enabling environment is provided for the rural communities within EMA to become part of the global information society.

6. Preservation of local indigenous knowledge on the Digital Doorway

The individual's right to free and equal access to information and knowledge is a fundamental democratic principle (Hedelund, 2006). As part of social services, public libraries are well positioned to insure free and equal access to information and knowledge. By virtue of their focus on preservation and dissemination of information, they are ideally situated to facilitate the management of knowledge (Snyman & Van Rooi, 2006) and to provide opportunities for individuals in local communities to acquire the information necessary to make informed decisions.

Africa and African libraries and information centres are poorly equipped to make a meaningful contribution to the current global digital knowledge economy. African local content on the Web remains low due to lack of capacity to produce, transfer and disseminate information (Mchombu, 2006). This in turn retards buy-in from local communities into digital resources and inhibits digital skills development.

With the establishment of the Digital Doorway kiosks and the container libraries in remote rural areas around Durban, eThekwini Library hopes to develop an online database of local indigenous knowledge with the active

participation of local communities (Greyling, 2008). The recent emergence of Web 2.0 technologies has enabled large-scale collaboration in the creation of data online (Farkas, 2007). Furthermore the high degree of flexibility in the latest social software allows a dynamic environment which can be easily adapted to serve specific community needs. It is therefore planned to develop the database using Wikimedia software. Wikis are people-centered, they promote discovery, creation and sharing of knowledge (Grand, 2006). Ultimately they promote lifelong learning through community information provision. By making use of Web 2.0 technology to host the website local community collaboration will be encouraged.

In a multi-pronged approach community field workers will collect oral and visual material whilst community members will be invited to capture their own information electronically. Content will be added to the website at any of the municipal libraries or schools with Internet connectivity, and the library will act as moderator and custodian of the indigenous knowledge resource. A snapshot of this database will be uploaded onto the Digital Doorway so that the communities will have unrestricted access to their own knowledge, even if it cannot be fully interactive at this point.

Provision of local information on the Digital Doorway will ensure sustained community interest in the kiosks. Furthermore, by bringing Web technology to rural indigenous communities the library aims to create a virtual resource that is in step with the global information society while at the same time empower marginalized citizens through preservation of indigenous knowledge and through development of digital skills. Availability of local content on the Web will enhance use of digital resources.

7. Conclusion

Improved digital skills will contribute to economic empowerment of communities and be instrumental in poverty alleviation. Enhanced media literacy will contribute to participation in the knowledge economy, active citizenship and the socio-economic transformation of societies. An enabling environment for life-long learning, cultural expression and personal fulfilment will nurture the development of democracy.

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