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## **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 fragmented municipal service delivery. Communities living here typically suffer from high levels of poverty and low levels of economic opportunities.*

*This paper presents a case study in the harnessing of innovative ICT in order to enable these communities to become part of the global information society. It outlines the proactive role of public libraries in collaborative initiatives in developing digital competencies and providing online information.*

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

### **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 the growing importance of ICT and media in society, a new form of literacy is emerging: computer literacy or media literacy (Livingstone, 2004). 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 *et al.*, 2004).

Rural areas around Durban, South Africa, fall beyond the urban perimeter or sustainability line (eThekweni Area Based Management, 2005). 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 eThekweni 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, with a real potential to erode key natural asset resources.

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. The public library network of the eThekweni Municipality does not reach beyond the urban perimeter and is in no position to cater for the information needs of 25% of its citizens. In the absence of any kind of information service people are forced to consult other channels for their information needs (Seneviratne, 2007). In the EMA municipal, government, agricultural and health information are still mostly dispersed by word of mouth. Learners have to rely on the limited knowledge of family, friends, neighbours and teachers to provide information for school assignments. There is no promotion of recreational reading and no potential for nurturing a reading culture.

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. Mudannayake (2007) agrees to the importance of public libraries as a local gateway to information provision to grass root level, especially with the expansion of ICT. The public library could act as an information intermediary bridging the digital divide.

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). The combination of indigenous communications systems with appropriate use of modern low-cost communications technology will strengthen communication capacities for development of rural communities (Davids, *et al.*, 2005).

### **A National Initiative**

The Digital Doorway project is a joint national initiative between the national 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 in a quest 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 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. Within hours children mastered navigating the Internet and learned to download and play audio and video (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.

### **Design of 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). The design takes into account that users range in age from 5 years upwards, impacting on screen viewing angles and keyboard angles. Because the kiosks are mostly installed on verandas, environmental factors such as exposure to high temperatures, water and dust have to be considered. Unstable electricity supply is a further reality of life in rural areas.

Standard, commercially available computer components are used. This makes for easy assembly, installation and maintenance and ensures that the units are adaptable if original components become obsolete. The kiosk housing is custom built. The original Windows-based configuration has been upgraded to the improved, open-access-based software Xubuntu Linux, in order to save costs and do away with licence agreements. Meraka is doing software configuration in-house as needed (Madlala, 2006). The software is “self-healing” and can be remotely managed; it provides usage data on users, applications and duration of use. Content is regularly updated and menus are automatically updated with new content. There is also a remotely managed desk-top clean-up facility.

Each Digital Doorway is equipped with a server, two fat clients, and a satellite receiver. A GPRS backhaul connection (mobile communications technology designed for transmission of data) facilitates updating of content, real-time monitoring and user feedback. A USB port enables users to save files to a mobile flash drive.

Whilst the Indian model relies heavily on the Internet for the transfer of information, the local Digital Doorway 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. The kiosk serves as both 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. Snapshots of the Wikipedia and Project Gutenberg form the mainstay of the information resources menu, with additional 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, conservation, safety, hygiene and numerous other applications focus on life skills development. Users are able to create personal

accounts on the Digital Doorway to which they can save documents and a USB port allows transfer of documents to a flash drive for later printing.

A 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). The multi-terminal model of the Digital Doorway kiosk encourages social and peer interaction of users, dispersing skills and information more rapidly.

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.

### **Provision of Library and Information Services in rural Durban**

Approximately 67% (1500 square kilometers) of the geographic area enclosed within the municipal boundaries of Durban, the second largest city in South Africa, is rural or peri-urban in character. Out of a total populace of 3,09 million inhabitants (Statistics South Africa, 2001), the rural areas carry a population of around 750,000.

Faced with the vastness, extreme topography and other physiographic limitations of the rural regions around its perimeter, the EMA deemed it necessary to formulate appropriate strategies and policies in order to direct inhabitants on a path of ensuring sustainable livelihoods and an overall improvement in their quality of life.

In 2003 the eThekweni Municipality initiated the preparation of a Rural Development Framework plan (RDF) for the purpose of establishing strategies for the appropriate development of the rural areas of the municipality (eThekweni Municipality, 2003). The Area Based Management and Development programme (ABM) was established to produce urban design framework plans which would inform the location and provision of facilities (eThekweni Area Based Management, 2005). They would also spearhead implementation of the RDF with the support of municipal line departments.

Although public space guidelines set out by the RDF included the consideration of social amenities such as libraries, no permanent structures have thus far been provided. In 2007 the eThekweni Libraries Department identified four key areas in the rural regions in which library and information services were most needed. In order to bridge this gap in provision of library and information services to rural communities, the Systems Department of the eThekweni Municipal Library (EML) approached Meraka Institute to include eThekweni in their national roll-out plan of the Digital Doorway kiosks. Meraka was looking to expand their project into the KwaZulu-Natal Province and agreed to enter into partnership with eThekweni Municipality.

### **Roll out of Digital Doorways in the eThekweni Municipal Area**

In order to ensure that a Digital Doorway installation in a community would be feasible a number of site related requirements had to be considered. The Library Systems Department approached the Social Development Section of the Rural ABM to jointly drive the Digital Doorway programme in the EMA. Their knowledge of rural 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

site selection, information sessions with the community, and liaison with the Meraka Institute and their subsidiaries.

- **Site selection**

For people to teach themselves computer skills, computers must be easily accessible to potential learners in an environment conducive to experimentation. 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 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. 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 close by 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 computer kiosks. 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, Internet or any library subscription databases. 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.

- **Community liaison**

Active community involvement was encouraged through agreements with local 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 concept, presentations were held at ward meetings and schools in the four communities. Information leaflets and bookmarks in both English and isiZulu, the vernacular of the rural population were distributed. The proposed sites should be at central points, considering the vast majority of people have no transport. The kiosks should be in close proximity to several schools and in an environment that permits children to make a noise. The site should also be safe and secure to use at all hours. Ward councilors committed themselves and their communities through written agreements to support the kiosks. 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 accepted 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. Champions were trained by Meraka, with basic instructions of how to care for the units.

- **Deployment in the EMA**

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 locally connected through a wireless mesh network. Topography at the Ntshongweni site proved to be well 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 education 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 teach 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.

### **Digital Doorway User Statistics**

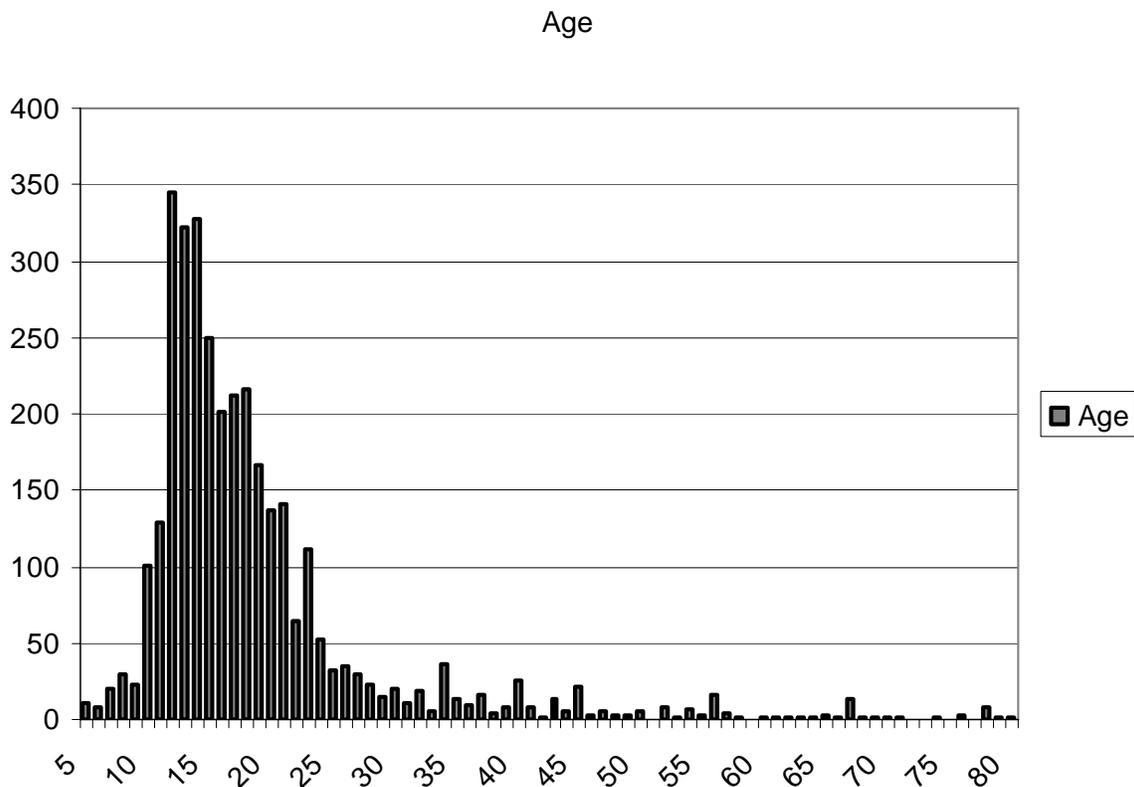
User statistics collected by Meraka show some interesting trends at a national level. The kiosk is mostly used by people in the age group 10-26 years. Usage is strongly male dominated, with four times more male users than female users. While people from various indigenous language groups are using the kiosk, 40% of them indicated that they prefer English on the kiosk, with vernacular language preferences reflecting placement of kiosks. 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.

User feedback is overwhelmingly positive. Comments that Meraka received include the following:

- Natasha Nchangacer, a student at the Albin 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.

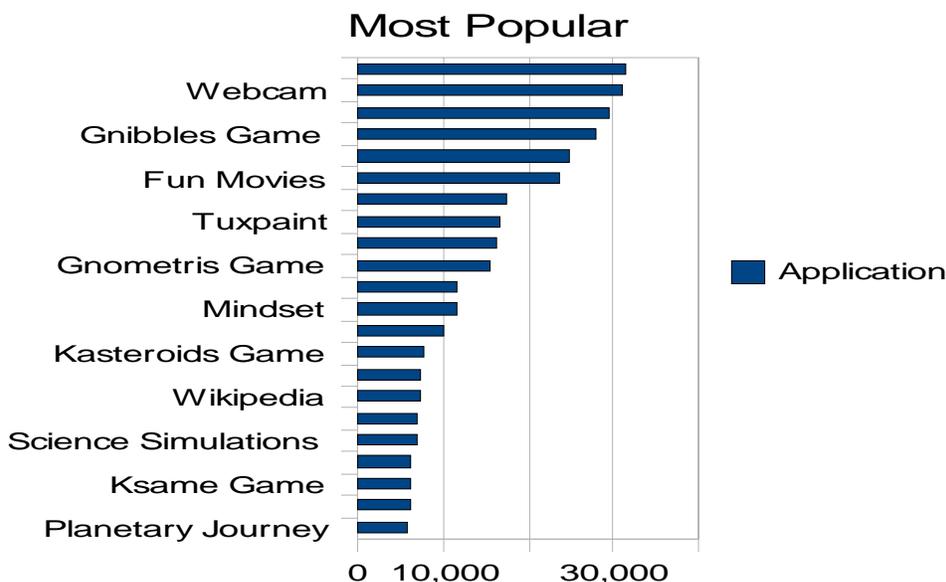
- Zama Zakwe tells how much he is enjoying the Digital Doorway computers and adds “. . .i wish you could add more brain teasing games if it’s possible . . . and the doorway computers help me in my school work.”
- Podile Lebogang writes “I would like to express my appreciation for the contribution that 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 1: Digital Doorway user age statistics**



**Figure 2: Digital Doorway content usage statistics**

# Application Statistics



These initial results and personal feedback suggest improved computer awareness, customised content and applications addressing community needs. Computer literacy is promoted without external resources and knowledge is transferred into the community.

## Container Libraries

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. In pursuit of these principles EML and Rural ABM departments embarked on another joint project with the aim of providing a basic library service to the information starved rural communities within municipal boundaries. Although developed as separate programmes, the commonality in vision and goals of the Digital Doorway and Container Library programmes paved the way for further collaboration between various stakeholders.

Rural ABM is providing capital funding, partially from municipal sources and partially from the European Union Development Fund. A contract with a local emerging contractor has been procured to refurbish second-hand twelve-metre shipping containers. In accordance with library specifications the containers are fitted with 90 running metres of shelving, a display unit/magazine rack, issue desk, electricity, air-conditioning and electrical lighting. 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. Aluminium awnings provide shade to a paved area outside the containers where seating with tables and chairs will be provided. Ramps for disabled people are added at all sites.

EML is providing books, training, administration and operational costs. Books are processed at the Library's Technical Services Department and are recorded in the online library catalogue even though the container libraries operate manually. 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. Volunteer staff from the immediate community are employed through the South African National Civic Organisation (SANCO) and trained at the closest established library. Library management oversees administration of the integrated service and provides direction and leadership.

Deployment of the Digital Doorway kiosks at the same sites as the container libraries sparked the idea of collaboration with the Meraka Institute in content development for the Digital Doorway to include a snapshot of the library catalogue. This is currently being developed and will contribute towards effective information retrieval. The integrated library service provides a low-cost, one-stop information shop, targeting learners and tertiary students. The focus is on reader education and digital literacy and the provision of an enabling environment to steer rural communities within EMA towards global understanding.

### **Preservation of local Indigenous Knowledge on the Digital Doorway**

With the establishment of the Digital Doorway kiosks in the greater Durban area, eThekweni Library further hopes to address the issue of access to local indigenous knowledge in these remote rural areas. Pacheco and Abbagliati (2006) support the notion that preservation and promotion of local knowledge provide a means for isolated communities to become part of the global information society.

In spite of the fact that it has become an important resource in planning and managing sustainable development projects, Nyumba (2006) is of the opinion that library and information professionals have not been taking the lead in the management of indigenous knowledge. Libraries and information centres in developing countries are poorly equipped to make a meaningful contribution to the current global digital knowledge economy (Greyling, 2008; Mudannayake, 2007). Typically African local content on the Web remains low due to lack of capacity to produce, transfer and disseminate information (Mchombu, 2006). This retards buy-in from local communities into digital resources and inhibits digital skills development. Ondari-Okemwa and Minishi-Majanja (2007) note the major challenge facing governments in Africa in the employment of e-governance due to the slow uptake of ICT by the citizenry. Buthelezi (2007) calls upon Africans to value their own indigenous knowledge by conservation and expansive implementation thereof. Harris, Vogel and Bestle (2006) agree that ICTs can be used to support socio-economic development of rural poor populations.

eThekweni Municipal Library is addressing this multi-faceted problem through an Indigenous Knowledge Management programme which aims 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). The high degree of flexibility in social software allows a dynamic environment which can be easily adapted to serve specific community needs. It has thus been decided to use WikiMedia software for this development. Wikis are people-centered, they promote discovery, creation and sharing of knowledge (Grand, 2006). By making use of Web 2.0 technology local community collaboration will be encouraged and digital skills enhancement promoted.

Various authors (Ranganathan, 2005; Raseroka, 2006) point out that existing ICT implementation adopts a top-down flow of information. Efforts to incorporate indigenous knowledge within this type of structure do not produce successful outcomes. The wealth of indigenous knowledge already available within local communities is culturally sensitive and context-specific, therefore a bottom-up approach should provide a more realistic opportunity to capture the ideals of people-centred, needs-based sustainable development. Following this philosophy the eThekweni programme is

based on a model developed by Greyling (2008), adopting a bottom-up approach based on active, prolonged community participation.

The programme is set up to allow community field workers to 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.

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 enhanced use of digital resources and sustained digital skills development. Availability of local content on the Web will not only promote consciousness and preservation of indigenous knowledge, but also create an enabling environment for life-long learning, cultural expression and personal fulfilment.

## **Conclusion**

Short term outcomes of this integrated project focus on digital skills development and access to local and global information for poor, isolated communities. In the longer term enhanced media literacy will contribute to participation in the knowledge economy, active citizenship and the socio-economic transformation of societies. Online access to information will steer rural communities to global understanding and nurture the development of democracy.

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