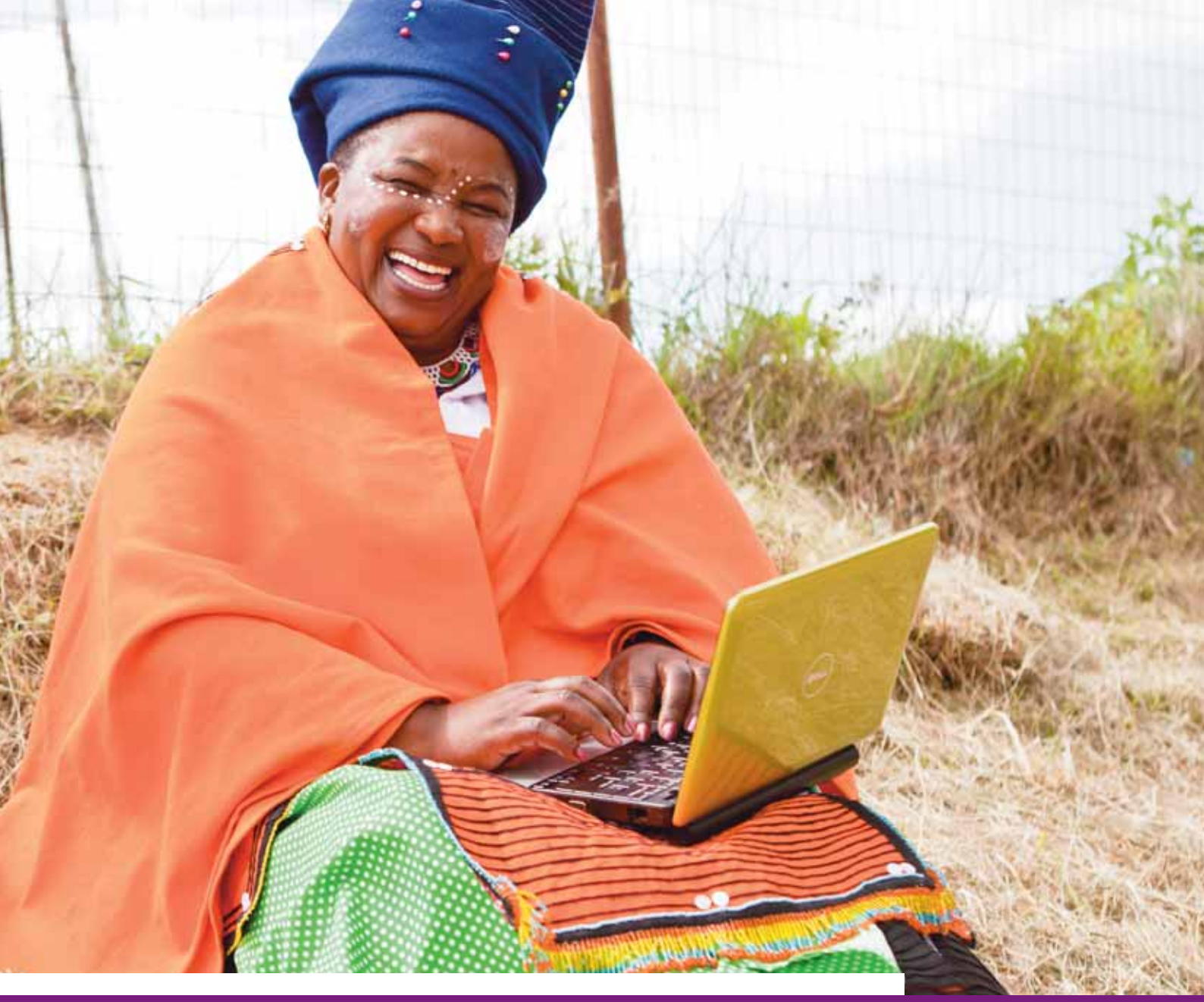


The Siyakhula Living Lab

An important step forward for South Africa & Africa

RHODES UNIVERSITY
Where leaders learn

www.ru.ac.za

SIYAKHULA
Living Lab

An important step forward for South Africa and Africa

Published:
Communications & Marketing Division
Rhodes University
November 2012

Editor & Writer:
Heather Dugmore

Design:
Design Aid

RHODES UNIVERSITY
Where leaders learn

University of Fort Hare
Together in Excellence

CONTENTS

We are growing together	3	The Siyakhula Living Lab
Vice-Chancellor's Distinguished Community Engagement Award	7	Combining research with community engagement
An academic committed to using research for the benefit of marginalised communities	9	Prof Alfredo Terzoli
ICT for Development: cultivating ethical leadership	13	Prof Mamello Thinyane
ICT rising: connecting marginalised communities	17	Prof Lorenzo Dalvit
Pinky and the Computer	20	Neziswa 'Pinky' Mcinga
People are so keen to learn	24	Educators discuss Siyakhula
Robust software products for rural areas	28	Reed House Systems & TeleWeaver
Growth of Siyakhula Living Lab	34	Sibukele Gumbo
Realising the full potential of the Siyakhula Living Lab	38	Goals, achieved outcomes and future objectives
15 years of Excellence	42	Telkom Centre of Excellence - 15 years
The Internet in rural communities - unrestricted and contextualised	44	Reports by: Profs Terzoli & Thinyane and Drs Clayton & Dalvit
The long way to the net	54	The difficulty of connecting rural regions in South Africa to the Internet
Key Participants	60	

A partnership between Rhodes University and University of Fort Hare

One of the rural villages in the Dwesa region where the Siyakhula Living Lab is serving 17 schools and their associated communities. The closest town of Willowvale is 40kms from here.

"Providing connectivity to our impoverished rural communities is a key priority because communications is a human right and it also facilitates development."

(Communications Minister, Dina Pule, at her first media briefing, 24 January 2012).

Learners at Ngwane Junior Secondary School, Dwesa, participating in the Siyakhula Living Lab. The school has 182 learners from Grade R to Grade 9.

The Siyakhula Living Lab - We are growing

An important step forward for South Africa and Africa

The declaration by Communications Minister, Dina Pule underpins the initiative called the Siyakhula Living Lab, launched in 2006 by Rhodes University and the University of Fort Hare in the field of Information and Communication Technologies (ICT) for Development in a marginalised rural community in the Eastern Cape Province of South Africa.

The 20 000 people who are part of this community live in what is known as 'Dwesa' in the Mbashe Municipality, close to the Wild Coast's Dwesa-Cwebe Nature Reserve.

As one should expect, this ongoing, long-term initiative is run with the full participation of the community. The name, Siyakhula Living Lab meaning '*we are growing together*' stresses this aspect, and was chosen in collaboration with the project participants.

Other departments at the two Universities (Anthropology, Communication, Education, African Languages, Information Systems, Journalism and Media Studies, and Sociology) are participating in the project, giving it a vibrant, and necessary, multi-disciplinary strength.

(http://www.coe.ru.ac.za/ & http://cs.ufh.ac.za/coe/)

The Siyakhula Living Lab or SLL (www.siyakhulall.org) is organised along the lines of the emerging Research Development and Innovation processes (RDI) *Living Lab* methodology of which the underlying principle is *co-creation of solutions with empowered users*.

It demonstrates in a practical manner how marginalised rural communities that are difficult to access, can be joined with the greater South African, African and global communities for the economic, social and cultural benefit of all.

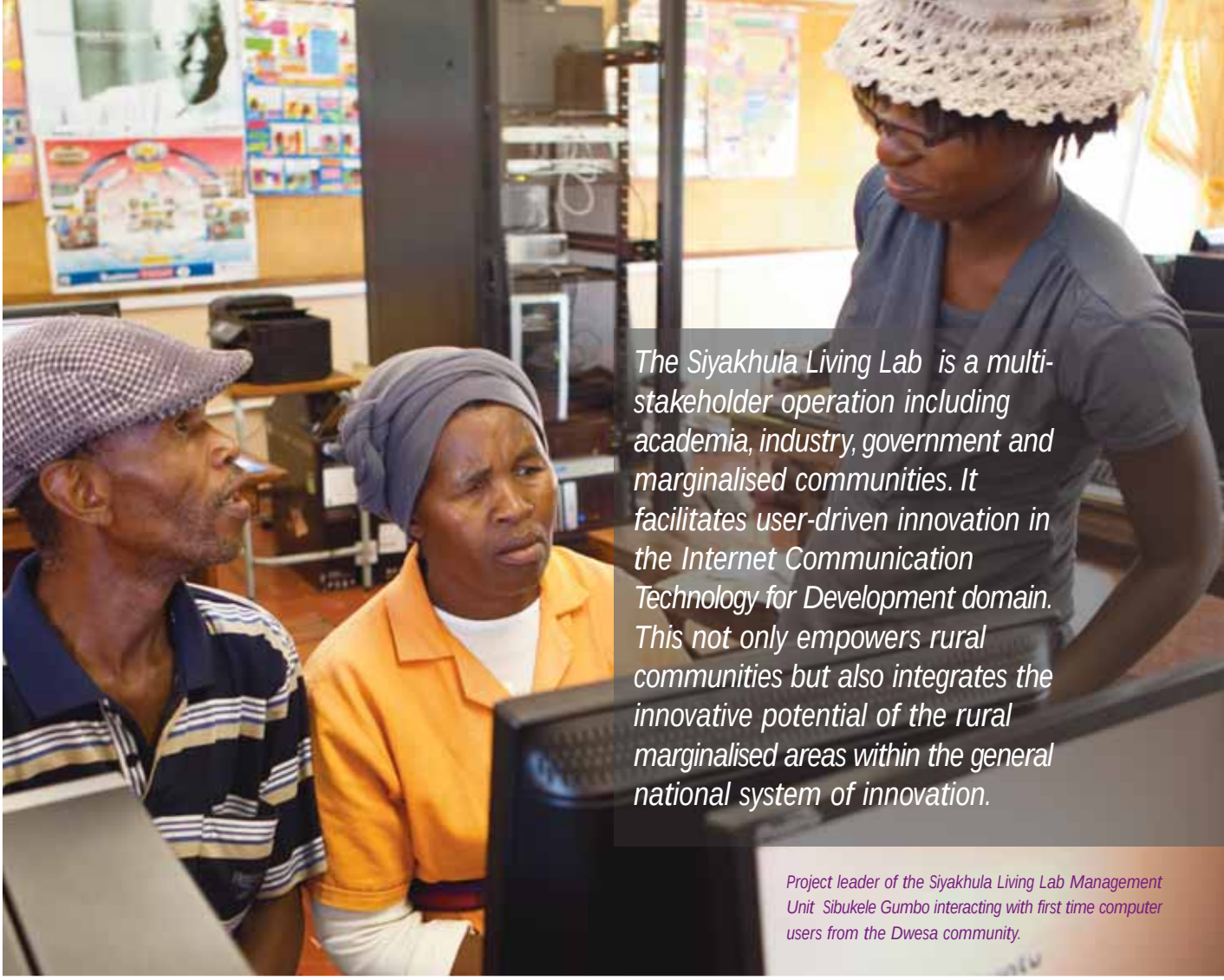
Other departments at the two Universities (Anthropology, Communication, Education, African Languages, Information Systems, Journalism and Media Studies, and Sociology) are participating in the project, giving it a vibrant, and necessary, multi-disciplinary strength.

Overall description and profile

The original objective of the project was to develop and field-test the prototype of a simple, cost-effective and robust, integrated eBusiness/ telecommunication platform, to deploy in marginalised and semi-marginalised communities in South Africa, where a large number (over 40%) of the South African population live. The project has evolved to offer generic communication-based services to rural areas in South Africa, based on the deployment of ICTs to schools, which collectively realise a distributed access network.

Since 2006 the Siyakhula Living Lab has been gaining the confidence of its local community in the Dwesa region where school learners and adults alike have obtained basic ICT literacy skills to a level that allows real participatory work and research to be performed.

Lindelwa Jongidiza completed her first computer skills training course in 2009 through the Siyakhula Living Lab. She is a Grade 4, 5 and 6 teacher at Ngwane Junior Secondary School, Dwesa, and she is also helping a group of women in Dwesa who make traditional Xhosa crafts to create a website and to market their work over the Internet.



The Siyakhula Living Lab is a multi-stakeholder operation including academia, industry, government and marginalised communities. It facilitates user-driven innovation in the Internet Communication Technology for Development domain. This not only empowers rural communities but also integrates the innovative potential of the rural marginalised areas within the general national system of innovation.

Project leader of the Siyakhula Living Lab Management Unit Sibukele Gumbo interacting with first time computer users from the Dwesa community.

Citizen participation

The Dwesa community lives in a cluster of villages with very low-density housing.

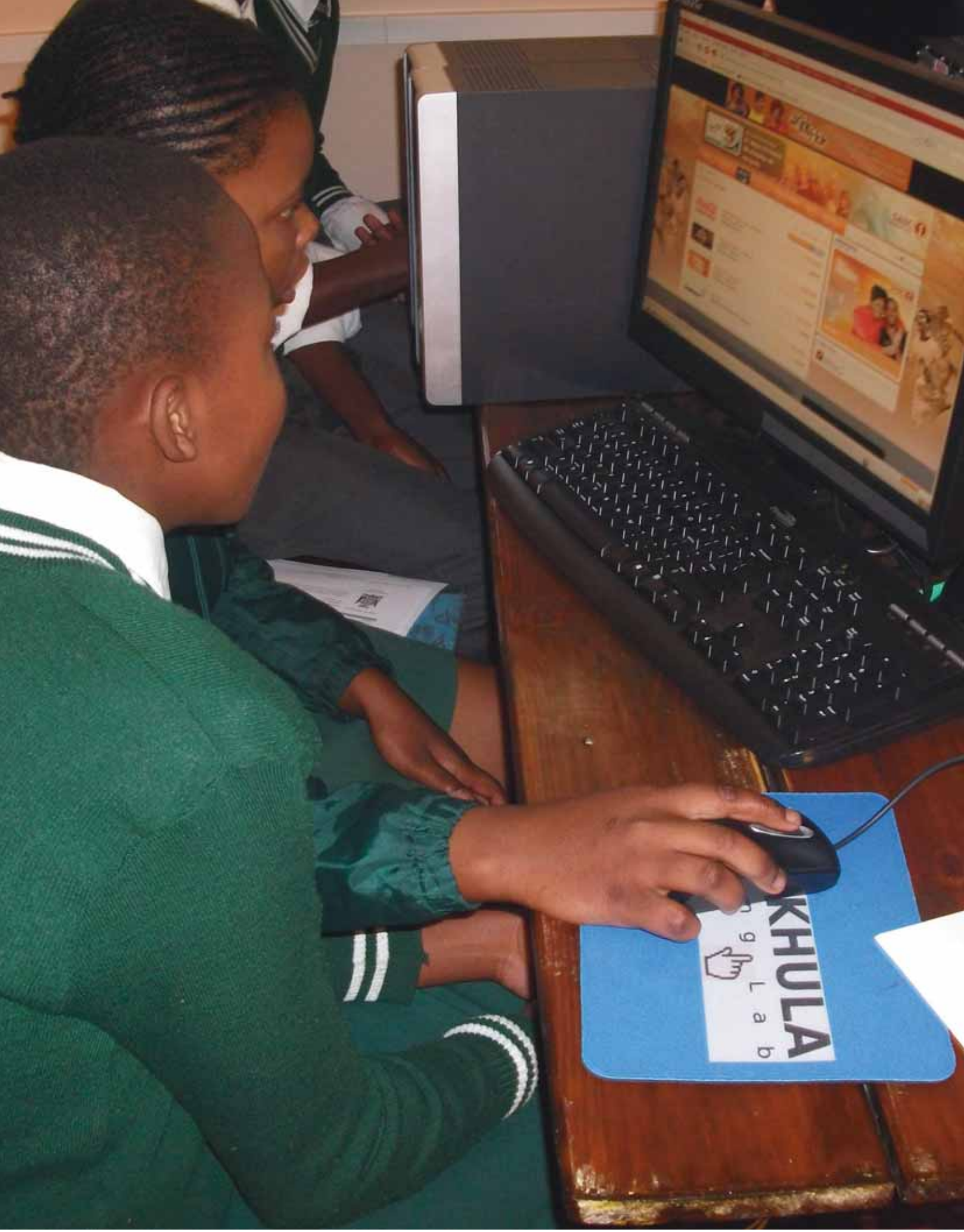
The SLL's current active user base is approximately 200 community members and 4500 learners drawn from 17 participating schools.

The research is situated directly in the community and progressively builds on ICT knowledge of participants; adapting and developing software to provide new tailor-made services for them.

It works as follows:

- First the community learns about ICTs using software developed by the Telkom Centres of Excellence (CoEs) at Rhodes and Fort Hare, based on best practices in the industry.
- In the next step, the value of ICTs is directly demonstrated through use. The value ranges from new information, such as demonstrating the presence of a virtual library on the Internet, to how to email, to communication cost savings.
- Finally, the community learns that ICT requires strong participation - and this involvement results in value for the community. An example is sales of traditional craft to global customers through participation in an eCommerce platform. Part of the process is to develop new value-adding services together with the community as the system evolves and as participation leads to new ideas. These ideas feed into new, robust software products for rural areas developed by Reed House Systems, a software house hosted by Rhodes University and launched in 2010 as part of the Siyakhula Living Lab.

The research being conducted by Rhodes and Fort Hare through the SLL is of great importance to South Africa and Africa as a whole. It is producing tangible skills upliftment and empowerment for impoverished communities in deep rural areas, and it is hoped that this can be extended to communities throughout South Africa and across the continent.



The Siyakhula Living Lab's current active user base is approximately 200 community members and 4500 learners at the 17 participating schools.

Over 60% of South Africa's population has no access to the Internet or any knowledge of how it can enhance their lives.

Prof Terzoli and his team work closely with community members to develop a system of technological connectivity that is sustainable and that addresses the specific needs of rural and peri-urban communities.

Professor Alfredo Terzoli assisting one of the learners at Ngwane Junior Secondary School, which is part of the Siyakhula Living Lab.

Combining research with community engagement

Vice-Chancellor's Distinguished Community Engagement Award

At Rhodes University's 2012 graduation ceremony, Professor Alfredo Terzoli, Head of the Telkom Centre of Excellence in Distributed Multimedia in the Department of Computer Science at Rhodes was announced as the recipient of the coveted Vice-Chancellor's Distinguished Community Engagement Award for 2011.

"I appreciate that the University recognises what we, as a group, have done over the years," said Prof Terzoli whose driving force is to facilitate effective and sustainable access to telecommunications in marginalised, rural and peri-urban communities. This, he said, "will provide an opportunity for better education and help to improve the quality of life and economic possibilities of community members."

The Vice-Chancellor's Distinguished Community Engagement Award is presented annually to a Rhodes University staff member who has dedicated his/her skills, knowledge and expertise to the development of mutually respectful, beneficial and socially significant initiatives and relationships in the area of Community Engagement.

Prof Terzoli was recognised for his work in establishing three outstanding initiatives aimed at social and economic transformation:

- The Siyakhula Living Lab in rural Dwesa in the Eastern Cape;
- The E-Yethu Schools Project in Grahamstown in the Eastern Cape;
- Information and Communication Technologies (ICT) capacity building at the University of Namibia.

Prof Terzoli and his team work closely with community members to develop a system of technological connectivity that is sustainable and that addresses the specific needs of rural and peri-urban communities. "The world is full of solutions that have been dreamed up in conference halls and that are totally at odds with the reality on the ground," he said.

Prof Terzoli joined Rhodes University"s Department of Computer Science in 1989. In 1998 he moved to the Rhodes' Computer Science Department's Telkom Centre of Excellence in Distributed Multimedia, which closely collaborates with the Telkom Centre of Excellence in ICT for Development in the Department of Computer Science at the University of fort Hare. This work has enabled Prof Terzoli to combine his research interests with his commitment to development and social justice.

The overarching role of universities in South Africa, Prof Terzoli believes, is to try to unify society by overcoming development gaps and fragmentations that alienate certain sectors of society. He said his team's work is essentially an economic pursuit because if these issues are not addressed they will have long-term economic implications for South Africa. "There is strong support for the idea that if you provide telecommunications in societies that haven't had them before, there is generally an improvement in their quality of life. We hope our projects contribute towards this."

E-Yethu Schools Project

The E-Yethu Project was started in 2005 to co-ordinate and formalise ICT for Development activities by staff and students in the Education and Computer Science Departments (ICTEd4D) at Rhodes.

This project aims to aid schools in sourcing computer and ICT equipment, support teachers and learners by providing a transfer of ICT skills, facilitate collaboration and communication between Grahamstown schools, as well as provide ICT literacy and training for teachers and learners. It currently provides Internet connectivity and technical support to eight schools in Grahamstown. Additional schools are being added to the network.

(Adapted from Rhodes University's staff magazine *Rhodos* May 2012 issue).

Access to the Internet has recently been recognised by the UN as a human right.

"The Siyakhula Living Lab brings a sense of being part of the world to people in remote rural areas; people who too often live with a sense that life happens elsewhere."

Prof Alfredo Terzoli.

Professor Alfredo Terzoli discussing the Siyakhula Living Lab with the Dwesa Community

Professor Alfredo Terzoli

An academic committed to using research for the benefit of marginalised communities

"I have an interest in people who find themselves marginalised or excluded by society - it's a trait of my personality," says Professor Alfredo Terzoli, head of the Telkom Centre of Excellence in Distributed Multimedia in the Department of Computer Science at Rhodes University.

If there were more people with this 'personality trait' the world would be richer for it.

Originally from northern Italy, Prof Terzoli first visited South Africa, Grahamstown and Rhodes in 1987 as part of his quest to "enlarge my world beyond Europe".

"I had been teaching Computer Science in Italy and I heard that Rhodes was looking for a lecturer in the subject. The idea of teaching at Rhodes grew on me and I applied, got the job and stayed," he explains. This year he has been part of the Rhodes academic staff for 23 years.

Connecting marginalised communities to the world

The Siyakhula Living Lab (http://siyakhulaLL.org/) was a natural progression for Terzoli, as it aligns his academic life with his social instinct. It connects marginalised and excluded communities to 'modernity' and to the rest of the world.

"It brings a sense of being part of the world to people in remote rural areas; people who too often live with a sense that life happens elsewhere," explains Prof Terzoli who initiated what was to become the Siyakhula Living Lab (SLL) in 1998 when he started working for the Telkom Centre of Excellence in Distributed Multimedia, hosted in the Departments of Computer Science at Rhodes and Fort Hare.

"To make a success of the Centre we needed to find a research area in which we at Rhodes could share skills and expertise with Fort Hare, which, as a former 'black' university had a technology department needing to be better resourced."

ICT for development - a natural match

Information Communication and Technology (ICT) for Development was a natural match and the Telkom Centre of Excellence ran with it. Building capacity and infrastructure at Fort Hare took several years, as did the development of the SLL, the motto for which is, '*Reconnecting marginalised communities through service co-creation*'.

By 2005 Prof Terzoli and his team felt they were ready to go into the field. "By then we had enough students and infrastructure to operate effectively and we contacted the community living in the vicinity of the Dwesa-Cwebe Nature Reserve on the Wild Coast in the rural Eastern Cape."

The Dwesa community

The Dwesa community is every bit a marginalised, rural community. Many of the members of the community do not have electricity in their homes, which are the characteristic combination of more modern brick houses, shacks and traditional Xhosa dwellings that make up the village. The people here subsist on government grants, the few crops they grow, livestock and seafood when they can access it.

The closest town is Willowvale, which is 40 kilometres away, and the Dwesa community members spend a great deal of their minimal income on transport to Willowvale or Dutywa which is 30 kilometres further, for shopping and general business. Learners and young people have few prospects in the area, and generally head off to find work elsewhere, leaving a high percentage of older people to look after the children.

The SLL team approached the Dwesa community because Rhodes already had a good, existing relationship with them through Professor Robin Palmer and the University's Anthropology Department, which had been collaborating with the community for some time. The Rhodes Institute for Social and Economic Research (ISER) also had a

Community members in Dwesa, particularly the women, are active participants in the Siyakhula Living Lab.

relationship with the Dwesa community, which achieved one of the first successful land claims in South Africa where the nature reserve was returned to the community.

Prof Palmer introduced the SLL team to the community and the project took off, with funding from Telkom, and the Cooperation Framework on Innovation Systems between Finland and South Africa (COFISA).

The Siyakhula team of postgraduate students

The Siyakhula team of postgraduate students, most of them from the Rhodes and Fort Hare Departments of Computer Science, others from the Departments of Information Systems and Education, and the School of Journalism and Media Studies at Rhodes, started to regularly visit Dwesa from 2006 and has continued to do so ever since. The team currently includes five Masters and three PhD students from Rhodes and ten Masters and three PhD students from Fort Hare.

> "In 2005 there were no computers and no electricity in any of the schools, but we knew it was coming, which it did, to several schools in 2006," continues Terzoli.

Schools were selected as the community ICT hubs, in consultation with school principals and the community, with everybody agreeing that the whole community could benefit from the computers, and be taught to use them.

Computer labs in class and staff rooms

The electricity in the Dwesa region is erratic and not of the best quality, which causes problems with the computer equipment as a result of bad surges and spikes, but the team knew from the outset this was a highly challenging environment for ICT.

The first installation was at Mpume School, which has 159 learners, where five computers were set up in the staff room. The first line of training was for school staff and community members, who attended two-week training sessions. They then imparted the knowledge to the learners and interested community members. Other schools followed, such as Ngwane, with 182 learners up to Grade 9, where 20 computers were installed in a classroom set aside as a computer room.

Siyakhula now has 17 participating schools with learners at some of the schools numbering as many as 400 to 600.

The learners were excited from the outset

"The learners were excited from the outset and got the hang of using the computers, email, social media and the Internet pretty quickly," says Prof Terzoli.

"Typically, young people learn ICT faster than older people and the more time they spend on the computers the more they learn. It has also proved to be a wonderful sharing experience for the communities because community participants, particularly the women, have been keen to come to the schools to learn."

The Pigs Story

In one of the early learning classes when they were introduced to the Internet, community participants

wanted to know if the Internet could help them find out what had happened to the compensation money the government had promised them. This was as a result of their pigs being slaughtered because of the swine flu epidemic that hit the region some time back.

They did a Google search and discovered there was an application form they had to fill in - this information had never been shared with them. It was a wonderful demonstration of the Internet's usefulness, and they filled out their forms and subsequently received the compensation. This early learning experience has since come to be called 'The Pigs Story'.

"We really need more social scientists to document this kind of breakthrough, and we have tried to get financial support for this but it has not been forthcoming yet," says Prof Terzoli.

A strong, multi-disciplinary initiative

The Computer Science and Information Systems postgraduate students from Rhodes and Fort Hare have maintained an ongoing presence in the community for the past seven years, and regularly visit for week-long community engagement and learning sessions. Other departments at the two institutions (Anthropology, Communication, Education, African Languages, Information Systems, Journalism and Media Studies, Sociology) have joined the project, making it a strong, multi-disciplinary initiative.

"It's been a transformation for communities in the Dwesa region and we are trying to encourage the government to extend the SLL system to other marginalised communities in South Africa. We feel it is very important especially when you consider that over 60% of South Africa's population has no access to the Internet or any knowledge of how it can enhance their lives. They can only do the basics on cellular phones but that is not enough," says Prof Terzoli.

Government needs to come on board

"It's a big project with great potential but we need government to come on board and commit funds to the project to ensure its continuation and expansion. We are interacting with the Technology Innovation Agency, the Departments of Science and Technology, Communication, Education, Rural Development and Land Reform, as well as the Department of Economic Development in the Eastern Cape."

"We want to see all the rural schools in South Africa connected, and through them, the surrounding communities. We are ready for this but we need support."

The SLL team has demonstrated the effectiveness of the project but apart from a good response from National Treasury (which cannot fund anything directly) there has been no follow-up funding from any of the government departments or agencies. This is puzzling given the government's development drive and President Zuma's pledge to develop the rural areas. As Prof Terzoli emphasises: "We want to see all the rural schools in South Africa connected, and through them, the surrounding communities. We are ready for this but we need support."

Let's hope that 2012/13 is the era of expansion and buy-in for this life-changing initiative.

Schools were selected as the community ICT hubs, in consultation with school principals and the community.

"Our vision and goal is to go large. We think the model we have and what we are doing holds enormous potential to help people all over South Africa and into Africa."

Prof Mamello Thinyane

Learners at one the Siyakhula Living Lab schools in Dwesa. Typically, young people learn ICT faster than older people.

ICT for Development

Cultivating ethical leadership

"Ours is an exciting environment with lots of work to be done and lots of learners with plenty of energy," says Professor Mamello Thinyane, Head of the Telkom Centre of Excellence in ICT for Development (ICTD) at Fort Hare University.

Prof Thinyane took up this position in 2010 after completing his PhD at Rhodes University in Computer Science. He has been closely involved with the Siyakhula Living Lab (SLL) from his student days and continues to be as an academic.

The SLL is jointly run by the Telkom Centres of Excellence at the two universities.

"ICT for Development is the core focus of the Centre at Fort Hare, which was established as an independent Centre in 2002, with a focus on rural communities. Prior to that it was a unit of the Centre at Rhodes," explains Thinyane who closely collaborates with Professor Alfredo Terzoli who heads up the Telkom Centre of Excellence at Rhodes and is also the Research Director at the Centre at Fort Hare.

A primary mandate to produce postgraduate students

Both Centres are hosted in the Computer Science departments at the two universities with a primary mandate to produce postgraduate students and to contribute to the body of knowledge in the computer science field.

The Fort Hare Centre of Excellence produced its first PhD student in 2010. It currently has three PhD students, 10 Masters and 16 Honours students. This is significant growth since 2002 when there were no postgraduate students in Computer Science at Fort Hare.

Several postgraduate students from Fort Hare are directly involved in the SLL at Dwesa and closely collaborate with their Rhodes peers. They travel down to the project together, share the base at Dwesa, collaborate on their research and help each other with their respective competencies.

Sensitive to development issues and ethical leadership

"At Fort Hare and at Rhodes we set out to train students to not only complete their degrees but also to be sensitive to development issues and ethical leadership. We really hope that when they leave us to go out into the world they go with a heartfelt need to help others," says Prof Thinyane.

Globally there has been a Technology for Development drive over the past ten years and the Centres recognised the potential and challenges in rural South African settings, with the Dwesa community in the Eastern Cape offering a typical example.

"There really was nothing in the area in terms of computers and ICT, as is typical of most rural settings in South Africa," Prof Thinyane explains. "This posed various technical challenges, but the technical challenges were far easier than the social challenges in this extremely isolated rural community."

"It's difficult to quantify changes in attitude but there is definitely a tangible sense of pride in the community that they are no longer at the end of the world. Many of the teachers also feel so much more motivated because they have computers as learning tools."

Prof Mamello Thinyane

Prof Mamello Thinyane (centre) on his first visit to Dwesa as a member of the founder Siyakhula Living Lab team. At the time he was a student doing his MSc on Wireless Hotspot management systems at Rhodes University. With him are fellow Siyakhula Living Lab students Martin Mandioma (left) and Gary Ndlovu (right), both of whom were doing their MSc at Fort Hare at the time.

"The community had limited access not only to computer skills, but also to other skills such as literacy, networking and entrepreneurship, and the basic needs of electricity and transport to market are major issues."

Developing suitable software, systems and platforms for ICT4D

The background work that led up to the first meeting with the Dwesa community started in 2002 with laboratory research by students towards developing suitable software, systems and platforms for ICT in rural areas, including eCommerce, eHealth and eJudiciary solutions.

At the time Prof Thinyane was doing his Masters on Wireless Hotspot management systems at Rhodes and was part of the initial team that met with the community seven years ago, and launched the Dwesa Project that evolved into the SLL.

Peer-to-peer relationship system

Each of the 17 SLL schools at Dwesa serves as a hub for the community living in the villages around each school. The number of hubs in this peer-to-peer relationship system is determined by how closely situated communities are to each other. The hub can be situated in any building - including clinics, spaza shops and private homes. In the Dwesa context the schools were selected because they have electricity and because they are a good access point for all community members.

"We were very clear from the outset of the project that we were deploying the technology for the benefit of the whole community," says Prof Thinyane who has regularly visited Dwesa since 2005.

In this time he has seen important changes. "It's difficult to quantify changes in attitude but there is definitely a tangible sense of pride in the community that they are no longer at the end of the world. Many of the teachers also feel so much more motivated because they have computers as learning tools."

A whole lot of Pinkys out there

"We've seen so many learners and community members like Pinky Mcinga grow through the project, and we believe there are a whole lot of Pinkys out there who are benefiting from ICT for development in a whole lot of ways and we want to do more," adds Prof Thinyane.

To take the SLL to the next phase of far larger impact by including many more communities, the project needs extensive support from government.

"Our vision and goal is to go large. We think the model we have and what we are doing holds enormous potential to help people all over South Africa and into Africa."

Most of the people in the villages that populate Dwesa's mountainous landscape survive on government grants and subsistence agriculture. The Siyakhula Living Lab sets out to improve their lives.

At present four of the Siyakhula Living Lab schools in Dwesa have dedicated computer labs, four use their staff rooms and nine use classrooms to host the computers.

"Only one of the teachers in the Dwesa community had ever been exposed to computers so we started from scratch with the teachers and learners. They had a very positive attitude to the arrival of technology and were very motivated and committed. We are delighted with the uptake."

Prof Lorenzo Dalvit, MTN Chair of Media and Mobile Communications in the Rhodes School of Journalism and Media Studies.

Prof Lorenzo Dalvit was part of the first Siyakhula Living Lab team to visit the Dwesa community seven years ago.

ICT rising

Connecting marginalised communities

Prof Lorenzo Dalvit's first visit to the Dwesa community was in February 2006 as part of the team of postgraduates from Rhodes and Fort Hare that initiated the first computer lab at Mpume Primary & Junior Secondary School where they initially installed six computers.

"The Dwesa community is absolutely off the beaten track and there could not have been a better site for the Siyakhula Living Lab (SLL) to be tested. This region has all the ICT challenges you'd expect in a deep rural area," says Prof Dalvit.

The main purpose was to physically set up the computers in the staffroom of the school, which was identified as the best space at the time. The team closely interacted with the school's principal Mr Emilius Pakati and with the teachers to collaborate on the best way forward for the lab.

Schools as points of presence

"The project idea from the outset was to have this and other schools as the 'points of presence' for an increasing number of villages in the Dwesa region. At Mpume, and subsequently at several other schools, they were most enthusiastic about this and welcomed us warmly," continues Prof Dalvit.

Mpume was one of the first schools in the Dwesa district to receive electricity through Eskom in 2006. This made it an obvious starting point for the lab, given that most community members do not have electricity in their homes.

Mutual learning and mutual dependency

The team realised that their presence, accompanied by the arrival of technology, might be a bit intimidating for some of the members of the community, and they made an explicit effort to close the gap. "This project is about mutual learning and mutual dependency; it is 'our' project."

"The first training session focused on how we envisaged the project and how the principals and teachers envisaged the project to find common ground," says Prof Dalvit.

"They were excited about the arrival of technology but they didn't have well-defined expectations as they hadn't worked with IT before. They had no experience, for example, of using the Internet as a teaching tool."

Most important was the enthusiasm and participation of the principal and staff members as they set the tone and context for the success or failure of the project.

From here they started training a small group of teachers using open source software known as Ubuntu Linux. The teaching staff are of widely varying ages - from their twenties to their fifties. Those who came for training took to the system with relative ease, and started teaching the learners. As is the case with all new forms of ICT learning, the learners leapt ahead.

"All the software we use is open source because of its philosophy of sharing and community participation, which is what the SLL is all about," says Prof Dalvit who, with hindsight, says it proved to be the right choice. "From a technical point of view it's a robust, resilient software. We've had no problems with viruses and relatively few problems with computers freezing and crashing, which is essential in a setting where technical expertise is unavailable."

Open source software is available in African languages

"Open source software is available in African languages, which made it possible to run some of the Dwesa training sessions in isiXhosa, with isiXhosa teaching materials," explains Prof Dalvit who also spearheaded the translation of the Google search interface into isiXhosa through Rhodes University's School of Languages. "The next step is to translate parts of Wikipedia into isiXhosa," he adds.

100 students from Rhodes & Fort Hare

The training team made monthly trips to Dwesa, spending a week at a time to establish a regular presence in the

"Open source software is available in African languages, which made it possible to run some of the Dwesa training sessions in isiXhosa, with isiXhosa teaching materials." - Prof Lorenzo Dalvit

area. They set up home in a typical village house that they rented as their base. "We felt it was important to stay in the community and live as the community members do, from eating what is available locally to using outside toilets, as does everyone else," says Prof Dalvit.

Six years later approximately 100 students have visited Dwesa from the two universities and successive teams continue to visit on a regular basis. Their presence is a natural part of community life now.

A magnificent, instant library

One of the key early learning experiences regarding what the Internet could offer the community was the 'Pigs Story' as discussed by Professor Alfredo Terzoli. Another giant learning leap was for teachers and learners to discover that the Internet was akin to having a magnificent, instant library at their disposal that offers them access to the world. An additional factor from an access point of view is that the community has learnt to use social media like Facebook, Twitter and Mxit to communicate and to maintain and strengthen ties with friends and family members who live or work elsewhere.

Women dominate amongst those wanting to learn computer skills

Women dominate amongst the community members who have volunteered to learn computer skills over the years, attending training sessions three times a week in the afternoon.

"A pattern that is common to most rural areas is that active young men usually go and work in the towns. So there aren't significant numbers of them around. But apart from this, the women have shown themselves far more willing to learn. Part of the charm of the project is the fact that the women have been able to empower themselves and acquire status in a society that is still very patriarchal," says Prof Dalvit.

Certain individuals shone, such as Teresa Mqikela and Neziswa 'Pinky' Mcinga. Their drive to learn computer skills and the way they took the initiative to train other members of the community was inspiring. Mqikela is a teacher and Mcinga became an admin clerk, both in Siyakhula-aligned schools. Both actively volunteered as community ICT trainers in the afternoons.

Increasing the status of the schools

As a result of the introduction of computers to 17 Dwesa schools, an increasing number of learners are remaining in the Dwesa area to do their schooling. It's a significant skills asset and it adds to the status of the schools, whereas previously there was a tendency for those learners whose families could afford it, to send them to better-equipped schools in the towns.

The Dwesa community is also benefiting from greater access to government and health services through the SLL, which contributes to a more informed community. The project also runs an accredited ICT teacher training course in the area, sponsored by the Department of Education. This brings people from far and wide into the Dwesa region, with associated transport and hospitality opportunities for the local community.

"At the core of the project is the goal to shift Dwesa from a periphery community into a thriving centre with opportunities for residents and learners," says Prof Dalvit. "We are now expanding inland and our dream is to have the model replicated throughout South Africa and sub-Saharan Africa."

Saab Grintek's Ian Slee preparing the mobile WiMAX radio unit for mounting on the 12m tower in Dwesa for the Siyakhula Living Lab. Saab Grintek is a Fort Hare Telkom Centre of Excellence industry partner.

ICT is a significant skills asset for learners in Dwesa.

"I surprised myself because I was not a brilliant student at school. What I have in my favour is that I always loved reading and finding out new things."

- Ms Pinky Mcinga

As a result of the introduction of computers to 17 Dwesa schools, an increasing number of learners are remaining in the Dwesa area to do their schooling.

Pinky and the Computer

Ms Neziswa Mcinga, known as 'Pinky', was 23 years of age and at a dead end in her life when the Siyakhula Living Lab (SLL) came to her community in deep rural Dwesa on the Wild Coast of the Eastern Cape.

"I'd completed my matric in 2001 at Badi High School in the Dwesa district where I was born and raised, and after matric I worked a bit here and there as a domestic worker in East London, but what I really wanted to do was to study," she explains.

Her prospects for tertiary education were non-existent as her father, Mr Fundile Mcinga, who raised her and who lives in Dwesa, is unemployed and on a disability grant. She also had a young daughter and three siblings to look after.

Ms Pinky Mcinga at the age of 23 in 2006 when she started acquiring computer skills through the Siyakhula Living Lab. With her is her baby daughter Silindokuhle Sihle who is now seven years old.

Globalisation has bypassed this place

Most people in the villages that populate the mountainous landscape are in the same position, surviving on a combination of government grants and subsistence agriculture. Globalisation has bypassed the villages where many hours of the day are dedicated to fetching firewood because the villages do not have electricity, other than in the schools. Some are more fortunate and recently acquired electricity, including in family homes. Apart from rain tanks, all the villages have communal taps, and many people have to walk quite a distance to fetch water.

The difficulties and inconveniences would be bearable if people in the rural areas weren't on a financial decline. Unplugged from the formal economy, their lives have become increasingly precarious as poverty and unemployment accelerates.

Like millions of young people in South Africa, Ms Mcinga was trapped between advancing poverty and her aspirations.

"An opportunity to learn for free and I grabbed it!"

"My family was really struggling and I had returned to Dwesa to be with them when I heard about this computer project that Rhodes and Fort Hare universities were busy with in our community," says Ms Mcinga. "I went to find out what it was all about and when I found out they were training all those from our community who wanted to learn ICT skills, I immediately started attending classes. Here was an opportunity to learn for free and I grabbed it!"

> A fast learner and highly motivated she quickly picked up the skills.

"I surprised myself because I was not a brilliant student at school. What I have in my favour is that I always loved reading and finding out new things. Even if I saw a newspaper lying in the road I would pick it up, grab my dictionary and look up the words I didn't understand. Plus I really wanted to learn so that I could hopefully find a job and help my family. They were all looking to me to come up with something and here it was," she explains.

Ms Pinky Mcinga in 2012 at Reed House Systems, a software house hosted at Rhodes University.

Ms Mcinga's father is exceptionally proud of his daughter who was one of the first people in the community to understand ICT and to help others to do the same. With some understanding of hard- and software, she doubled as the 'technician' on occasion when the computers stopped working.

One of the first searches Ms Mcinga did on the Internet was to look at the South African university sites, to see what was available to study. "From here I looked at how I could use social media networks like Facebook to reconnect with my Mother's side of the family. She left us and went to Johannesburg when I was four. Through Facebook I reconnected with family members and that's how I found out that my Grandmother had passed away."

Learning and teaching at the same time

Ms Mcinga is a natural leader and she started helping the teams from Rhodes and Fort Hare to train community members. "I was learning and teaching others at the same time," she explains.

"It helped that I am from Dwesa because I could identify with how people were feeling. Some were shy and intimidated by the students and academics in the beginning because they knew they were all from the universities while many people in Dwesa are not educated or are less educated. They had to get over the initial feelings that these people were more important than them. Another factor was that all the members in the community are black whereas the teams were white and black, and they needed to get used to this. It also helped that I speak isiXhosa."

The project created the opportunity for skills development, networking and exposure for Ms Mcinga, who subsequently applied for a job as an admin clerk at Ngwane Junior Secondary School - one of the SLL schools where the principal Mr Synford Ndinisa is highly supportive of this initiative.

"I got the job, and worked there during school hours and then trained about 25 people from the community in the computer lab at Ngwane in the afternoons."

Doubling as the 'technician'

Ms Mcinga's father is exceptionally proud of his daughter who was one of the first people in the community to understand ICT and to help others to do the same. With some understanding of hard- and software, she doubled as the 'technician' on occasion when the computers stopped working. "I'd call Rhodes and they would explain to me what to do over the phone," she explains.

> She also helped to show community members how they can make a living from the Internet.

Part of the SLL's vision is to create eCommerce opportunities for the local community, including a group of women who do beautiful, traditional Xhosa craftwork, including woven floor mats, tablemats, beaded necklaces and cushions. They sell these in the nearest town of Willowvale, which is 40 kms from Dwesa, but the market is limited.

Growing their eCommerce skills

The goal is to grow their eCommerce skills to be able to showcase their work to the global market through their own website and earn a living through eCommerce sales.

Community participation in the computer skills programme, Dwesa.

"They have certainly improved their computer skills towards developing entrepreneurial opportunities; now they need to learn how to manage an online business actively and sustainably, and to streamline deliveries so that several parcels can be posted from Willowvale at the same time," Ms Mcinga explains. Other online opportunities include the sale of Xhosa music from Dwesa.

Acquiring ICT skills has opened windows for hundreds of Dwesa learners over the past seven years. Without the SLL they would not have had the opportunity to acquire these skills in an ICT-dominated world. "As was the case with me, it substantially increases their prospects in life," says Ms Mcinga, adding that those who leave Dwesa to study further or find employment elsewhere, hopefully send money back to their families, and those who stay hopefully benefit from being plugged into new opportunities.

A place where things happen

"It's definitely helped to develop a different mindset in Dwesa - as a place where things happen rather than a place that is isolated from the rest of the world. I have personally changed a lot and I see myself very differently now."

"Before joining the Siyakhula project I felt miserable and hopeless but I knew I had to keep trying to find something that would change this. Now I see myself as someone with important skills and plenty of opportunities," explains Ms Mcinga who moved to Grahamstown two years ago and whose story has been made into an SABC2 documentary called '*Pinky and the Computer*' to inspire other young people from rural areas.

She has since moved to Grahamstown where she is a member of the team at the Reed House Systems software company hosted at Rhodes that specialises in software for rural areas and is included in the SLL 'ecosystem'. She is collaborating in the creation of e-services to be deployed in Dwesa.

"The eCommerce and eBanking side has a way to go in Dwesa because while the younger members of the community are totally comfortable with services like Internet banking, the older members still want to physically receive their cash, which means taking a taxi all the way to Willowvale at a cost of R60. Down the line we are hoping to get all members of the community used to the idea of virtual money, where, for example, they will be able to buy groceries at their local store and simply transfer the money online," explains Ms Mcinga who is also studying to be a social worker through Unisa.

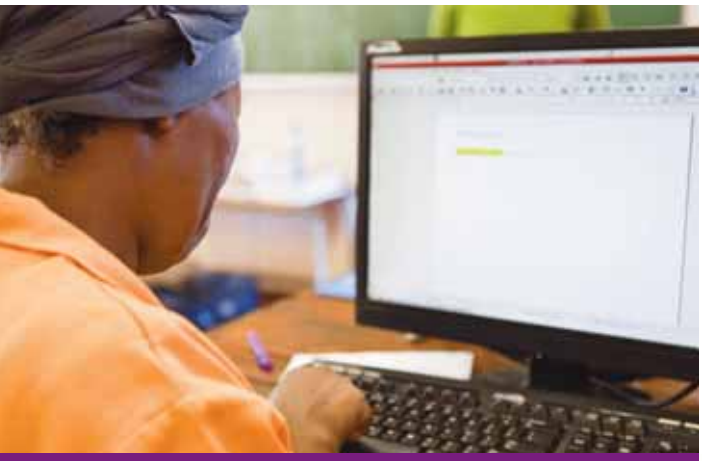
Stick to my heartfelt passion

"While I was at school I wanted to do civil engineering because that was the thing to do. Then with the arrival of computers at Dwesa I considered studying computer science. I thought about it long and hard, and realised that neither were for me; that I should stick to my heartfelt passion, which is to be a social worker, which is what I am doing now, as well as looking after my family," says Ms Mcinga who is now married and who has her daughter Silindokuhle Sihle (7yrs) and her two-and-a-half-year-old son Athambile Leonardo with her in Grahamstown.

An important member of the community

"I miss Dwesa and my family and friends there a lot. I enjoy the family feeling in our community; you never feel lonely because people greet you wherever you go and they are friendly and helpful. Fortunately I am able to visit with the project from time to time," says Ms Mcinga who is welcomed as an important member of the community whenever she returns. "It's a very nice feeling - to know that I have contributed because I like working with people and with children a lot."

One day she hopes to return to Dwesa to live but for now her life is in Grahamstown. "I am just so happy that I am able to support my family and to see how my life has transformed."



Services such as the online registration of births and deaths should be made available to rural people.

"I was 46 when I did the training and I used my confidence to learn because I would see that we really needed computer skills in our school; our learners were crying out for them. I am really pleased I have this skill, which I am developing all the time."

- Ms Cynthia Gxarisa, Grade 1 teacher, Mpume Junior Secondary School, Dwesa

Through the Siyakhula Living Lab women have been able to empower themselves and acquire status in a society that is still very patriarchal.

People are so keen to learn

Educators from schools in Dwesa discuss the Siyakhula Living Lab

Mr Synford Ndinisa
Principal and English and History teacher, Ngwane Junior Secondary School, Dwesa
Grade R to Grade 9: 182 learners

"We now have more than 30 computers based at Ngwane through the Siyakhula Living Lab, which has made a great difference to the learners and to our community. All the grades are using the computers and we are particularly serious about teaching Grades 7-9 computer skills so that when they matriculate, this will hopefully help them with job opportunities. At this stage they have to go away to find jobs because there are no businesses as such in Dwesa where they can work."

"Several other schools in the Dwesa region also use our Lab, as do community members for both private and business use, and we have a community craft centre linked to it. For all these reasons I am very supportive of the Siyakhula initiative because it is not easy for us to get computers and the Internet in the deep rural areas."

"Government departments and private companies that can help Rhodes and Fort Hare to grow the Labs must please do so because they need to develop further, and reach other schools and more communities. The people in the deep rural areas really need this - there are many illiterate and unemployed people and we are lacking in facilities."

"The schools also need help. Our school is a poorly built temporary structure, which needs to be improved. Fortunately we now have 'Pay As You Go' Eskom electricity but with so many people using the Lab it is expensive and we now have to ask the other schools to help us cover the electricity costs."

"What motivates me to continue is that people in this area are so keen to learn. My dream is to see far more people educated here and to create projects for people to be able to get jobs here so that they are not forced to leave Dwesa and look for work elsewhere. This is a lovely, quiet community, we don't have political problems and we like to live here."

- Mr Synford Ndinisa

Top: Mr Synford Ndinisa, Principal and History teacher at Ngwane Junior Secondary School in Dwesa

Ms Cynthia Gxarisa
Grade 1 Teacher, Mpume Junior Secondary School, Dwesa
Grade 1 - 9, 159 Learners

"Our school was the first in the Siyakhula Living Lab project and we were the first teachers to be trained to use them in 2006. It was not easy because we had never worked on computers before. We'd only seen them in places like banks."

"I was 46 when I did the training and I used my confidence to learn because I could see that we really needed computer skills in our school; our learners were crying out for them. I am really pleased I have this skill, which I am developing all the time."

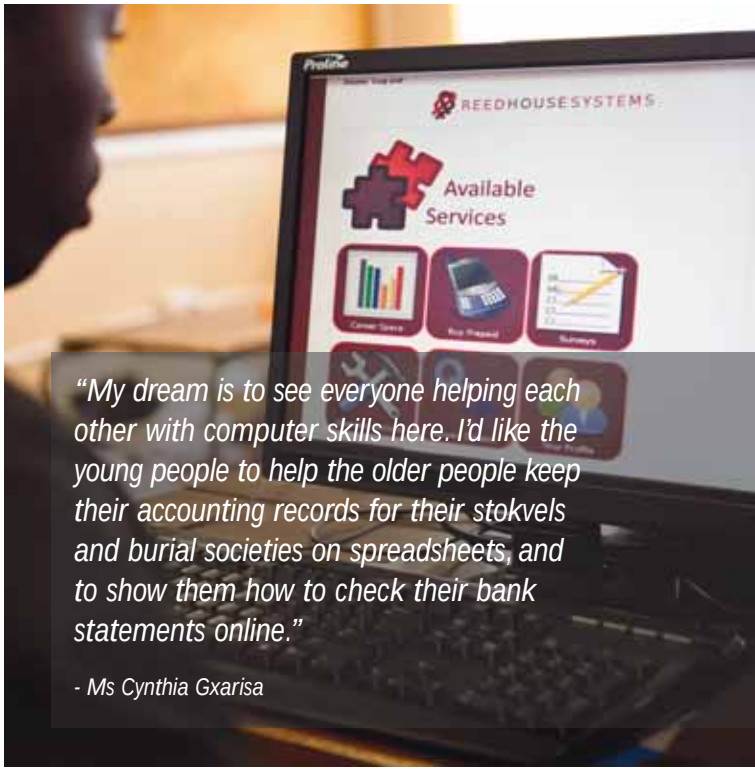
"We now have 10 computers set up in our staff room and all the learners use them. For example with my Grade 1 learners I use the numerical games programmes to teach them to count and to start them in mathematics. It helps them a lot."

"In the afternoons people from the community come to the school and I teach them basic computer skills, including explaining hardware and software, teaching them to write on the computer, how to send emails and how to use the Internet. Quite a few of them are confident in using computers now."

"I'd like to see people becoming comfortable with using eServices, such as eBanking, so that they can receive their grants directly into their bank accounts, and check on their balances, or use the Internet to check when the next grant date is scheduled. Some people here already get their grant money in their bank accounts; others get their money when the people dealing with grants come here to Dwesa.

"My dream is also to receive accreditation for computer skills. At the moment we get attendance certificates but accreditation certificates once we have completed the computer literacy course through Rhodes and Fort Hare would help people a lot because it would mean it can be used as a skills certificate when applying for jobs. The Universities are looking into this."

"Other than that I like it here in Dwesa. I was born and raised here and I have a traditional Xhosa home with a thatched roof and water tanks. I am fortunate to have electricity. It only came recently but I am happy to say that more schools are now getting it, as well as some private homes. It is hard to live without electricity. Many, many people still rely on fires for warmth and for cooking. The women spend many hours of the day collecting firewood and while some homes use candles and lamps, it's hard for the children to learn at night without electricity."



"My dream is to see everyone helping each other with computer skills here. I'd like the young people to help the older people keep their accounting records for their stokvels and burial societies on spreadsheets, and to show them how to check their bank statements online."

- Ms Cynthia Gxarisa

Above: Many people in Dwesa still rely on fires for warmth and for cooking. Right: In the afternoons members of the community come to the Siyakhula-aligned schools where they learn basic computer skills.

All the people quoted below are part of the ongoing two-week-per-month Basic Literacy sessions where Dwesa community members and educators are intensively trained in computer skills and the Internet by researchers participating in the Siyakhula Living Lab:

"As it was the first time to use a computer, it was so difficult, but as the time goes on, it is becoming better. I would like to be included in any further training."

Ms Nokuthula Mjekula, Educator.
Ntubeni Junior Secondary School.

"The classes are so interesting. I know how to use Internet banking now. The facilitators are good and flexible. They share all the information they have with us."

Mr Ludwe Sodladla, Educator.
Ngwane Junior Secondary School.

"Now I have an e-mail address! I'm no longer a principal of the past who had no e-mail address. Thanks for the nice tutors and also we would like to thank the project itself."

Ms Patiswa Ndawule, Principal.
Nondobo Junior Secondary School.

"Good Training. Thank you to Siyakhula Living Lab."

Ms Nokulunga Ngalwa, Educator.
Nondobo Junior Secondary School.

"Thank you for the training. I am able to do things on my own now."

Mr Vuyisa Siphunzi, Educator.
Mevana Junior Secondary School.

"Yhu sis andizange ndayibona into enje kangoba ngase ingaphumi iclass." (isiXhosa) English: translation "Yho sister. I have never seen anything like this before (the Internet). I wish we didn't have to come out of the class today."

Ms Sibongiseni Ntunja, community member.
Ngwane Junior Secondary School.

"Thanks guys. You have made us real people."

Ms Nokulunga Ngalwa, Educator.
Nondobo Junior Secondary School.

Ms Lindelwa Jongidiza
isiXhosa, Technology and Life Orientation Teacher,
Ngwane Junior Secondary School, Dwesa
Grade 4, 5 and 6

"The Siyakhula Living Lab has helped our community a lot, and the computer skills help the learners to get jobs. Nowadays everybody must be computer literate, and most of the work at school is done on computers," says Ms Lindelwa Jongidiza who completed her first computer skills training course in 2009 through the SLL.

Ms Jongidiza is enrolled in the Advanced Certificate in Education (ACE) in ICT, a two-year, part-time, professional development course at Rhodes University that prepares teachers to use ICT in schools for teaching, learning, research and administration.

"I would like to progress with my ICT skills and become a lecturer at Rhodes one day to help others as I have been helped."

The Dwesa community is 40kms from the nearest town.

Robust, resilient open source software known as Ubuntu Linux is used.

RHS specialises in community-oriented eServices solutions. Its core platform implements the latest Service-Oriented Architecture (SOA) technologies to provide an integrated environment for plugging in various service modules.

All software used by the Siyakhula Living Lab is open source because of its philosophy of sharing and community participation.

Reed House Systems

Robust software for rural areas

The need for robust software products suitable for the Siyakhula Living Lab (SLL) and associated deep rural areas, gave rise to a software house called Reed House Systems (www.reedhousesystems.com). It started its operations in 2010 and is currently housed in the Strueben Building on the Rhodes University campus.

RHS specialises in community-oriented eServices solutions. Its core platform implements the latest Service-Oriented Architecture (SOA) technologies to provide an integrated environment for plugging in various service modules.

The RHS is managed by the two Telkom Centres of Excellence and staffed by full-time software developers, as well as supported by postgraduate students and student interns from both universities, all of whom are committed to refining and developing new rural technology products.

Empowering disadvantaged communities through practical ICT

The staff members and innovators of RHS see a future in which marginalised, disadvantaged communities are empowered through practical ICT software applications that help them to enjoy the benefits of the information age and knowledge society.

RHS is currently hosted at Rhodes University, and offers internships to Rhodes and Fort Hare students.

TeleWeaver

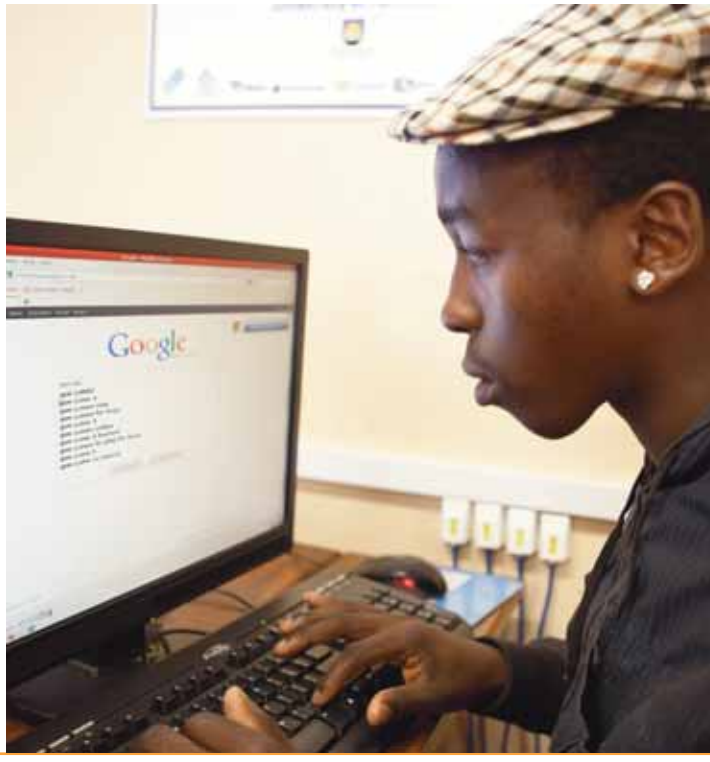
The RHS' service integration platform and flagship product called TeleWeaver is the first next generation enabler for rural telecentres and access nodes. It is built to custom requirements of such areas, taking into account their limited resources in terms of hardware and software. Hence the use of the Open Services Gateway initiative (OSGi) as a key mobile, middleware technology as a basis for TeleWeaver, which is so light it will even run on Java-enabled phones.

TeleWeaver is open source technology at its best: it is standards compliant and it uses tried and tested packages.

It evolved out of research conducted by postgraduate students where they initially had individual applications but realised that a 'silo' system approach was impractical. This led to a Masters project at Fort Hare supervised by Professor Alfredo Terzoli to investigate a middleware platform that operates as an *ecosystem* for various eService applications.

With TeleWeaver, for example, if the Department of Health wants to run a 'Get Tested' HIV/AIDS campaign, then they can upload the campaign or advert on e-health, and directly target the group at which it is aimed, such as teenagers in the Dwesa community. The Department of Health would be happy to pay for this type of communication and the community would receive a share of the revenue."

With TeleWeaver the Department of Home Affairs can effectively communicate with South African citizens no matter where they are.



TeleWeaver evolved out of research conducted by postgraduate students where they initially had individual applications but realised that a 'silo' system approach was impractical. This led to a Masters project at Fort Hare supervised by Professor Alfredo Terzoli to investigate a middleware platform that operates as an ecosystem for various eService applications.

Caption

Home Affairs does not have offices in rural areas like Dwesa, and this model would create a platform where, for example, people can send and receive ID information, send notifications of births and deaths, and send it in their first language. In exchange, the Department of Home Affairs will pay a transaction fee to the point-of-presence where TeleWeaver is deployed (normally a school), reducing the costs of the ICT infrastructure there. If enough applications are activated, the costs can be eliminated and the ICT infrastructure and its benefits will finally become sustainable.

Features

Through open web services interfaces, any system can be integrated with TeleWeaver.

The middleware uses Java EE, OSGi, Spring-Framework, Apache-CXF, and can integrate with any other technology such as PHP, Python, and ASP.

Services in the platform can be accessed either via fixed end points such as PCs in Digital Access Centres (an evolution of the old 'telecentres') or in homes, via mobile handsets, of whatever technology and generation (from 2G to 4G).

Applications

Applications include eCommerce support to:

- Sell local products and services (from beading to micro-tourism).
- Generate a *Curriculum Vitae* in response to a job advertisement found through another service in Teleweaver - the Career application service;
- Facilitate interactions with governmental entities at various level (such as ID requests and tracking of child grants from home affairs);
- Conduct surveys in the community;
- Facilitate pre-paid services.

The applications listed above are just a small subset: the idea is to have dozens of services over time.

Technology mix and blueprint

The technology mix can be adapted to specific needs and circumstances. This is important, given the dynamic field in which the Siyakhula Living Lab operates. The blueprint, in general, is as follows:

Connectivity

The starting point is the creation of a 'broadband island' i.e. the provision of points-of-presence known as Digital Access Nodes (DANs), typically located in schools, which are connected wirelessly to each other at reasonably high speed. For this connection fixed and mobile WiMax is used, which is very workable and cost effective. Wifi can be an option, as well as other technologies, depending on geographic and licensing particulars.

One or two of these point-of-presences or DANs have a connection to the Internet, to serve the whole broadband island. The nature of the connection to the Internet depends on where the broadband island is located.

In the SLL a satellite connection is used because of the remoteness of the community, but GPRS/3G can be considered, or even fixed lines, for peri-urban deployments. This architecture is the result of an evaluation of bandwidth needs and costs, and, not surprisingly, reflects the standard LAN/WAN structure, which still makes sense in certain contexts, but which will evolve if the costs or needs change.

Structure of each DAN

Each point-of-presence contains a variable number of terminals, realised as thin clients. Depending on the circumstances, the central server is a single machine or a cluster of a few, less powerful machines. All elements in the DANs can be either new or refurbished. Edubuntu, of the Linux OS family, is used throughout the deployment.

Siyakhula Living Lab current study areas

Current study areas in the SLL are:

- Broadband telecommunications network models for rural and peri-urban communities;
- eService provisioning for rural and peri-urban communities;
- Financial, technical and cultural models for rural and peri-urban ICT initiatives;
- Monitoring and evaluation of rural and peri-urban ICT initiatives;
- Rural and peri-urban user requirement elicitation;
- ICT in Education.

More detailed info on each of these points, together with some of the literature published on them, can be found at *http://www.siyakhulall.org/?q=activities*

Reed House Systems current developments

RHS is currently finalising a complete version of the middleware platform (the core and TeleWeaver), with supporting documentation. The platform will be released into the open source community in the second half of 2012.

The Siyakhula Living Lab can serve as a cornerstone towards ensuring the vulnerable are seen and heard. It is the project's hope that government will recognise the key role that the SLL can play in offering eSolutions to address the situation described by President Jacob Zuma.

Children of all ages are taught computer skills in Dwesa.

Africa's vulnerable go unseen: President Zuma

SAnew.gov.za

By Irene Naidoo

Africa's most vulnerable people are unseen and unaccounted for because there is no record of their existence, says President Jacob Zuma. Speaking at the 2nd Civil Registration and Vital Statistics Conference in Durban, Zuma expressed the concern over the scandal on invisibility - a situation where people are born and die without ever leaving a trace in any legal record of their existence.

"It has meant that the most vulnerable people in Africa remain unseen and not counted. They practically do not exist," he pointed out.

It was important for the citizens of all of Africa's 54 countries to be registered - a feat that could only achieved through efficient civil and registration systems. Once everyone in Africa was registered and accounted for, the continent could plan better for its people and its development, the President added.

"Africa cannot fulfill its development agenda unless we know, who we are, where we live, work and play and what we need to better our living conditions on the continent. Births, marriages, divorces or deaths are all vital events that must be recorded in any country," he added.

In the current age of globalisation and greater inter-dependence among countries, civil registration was much more than about just identifying a person's nationality.

"It is a pre-requisite for the successful implementation of African regional integration, as it facilitates the smooth movement of people among countries, and it is a critical tool for the promotion of democracy, in the event of the compilation of voters' rolls."

Furthermore, the benefits of good vital registration have a far reaching impact on broad developmental programmes such as the planning and monitoring of education, health, social security, unemployment, the President pointed out.

This included countries' abilities to measure health inequalities, priorities, monitor trends, evaluate development programmes including, the Millennium Development Goals, poverty reduction and other development efforts.

He assured delegates from the rest of the Africa, that Nkosazana Dlamini Zuma, who headed South Africa's civil registration campaign in recent years, would invest similar efforts into regional campaigns as the African Union Commission Chairperson.

With ICT skills at their schools, the future of learners in deep rural Dwesa has taken a promising step forward.

The Siyakhula Living Lab's dream is to have the model replicated throughout South Africa and sub-Saharan Africa.

"In 2011, SillMU organised a successful LLiSA workshop, which contributed to a white paper supporting the evolution of sustainable Living Labs and Living Lab networks in Africa."

The Dwesa community is benefiting from greater access to government and health services thought the Siyakhula Living Lab.

Growth of the Siyakhula Living Lab

The Siyakhula Living Lab (SLL) has significantly expanded over the years, with an increased number of role players, which has added to the complexity of its management. In response to this, a management unit of the SLL was established in 2009 to centralise all SLL operations. Called the Siyakhula Living Lab Management Unit (SiLLMU), it is funded by COFISA and SAFIPA.

The Project Leader of the SiLLMU is Ms Sibukele Gumbo, also known as 'Spooky', who elaborates on the SiLLMU and her role below:

"As a product of the University of Fort Hare Telkom Centre of Excellence, I take great pride in this ICT development initiative undertaken by the Universities of Fort Hare and Rhodes. It shows how ICT infrastructure, eService provisioning and eSkilling can reach and greatly benefit marginalised communities. As such, after the completion of my Masters in Computer Science, I decided that I wanted to be part of the force that is promoting rural ICT development while at the same time studying part-time towards my PhD."

Ms Sibukele Gumbo, the Project Leader of the SiLLMU

The SiLLMU's duties include supporting the operation on the ground and planning the sustainability of the SLL. I enjoy interacting with the Dwesa communities and maintaining close ties with all participants located at the 17 schools that operate as SLL Digital Access Nodes. In all rural initiatives, the communities have to be the focal point, and must be kept in the loop at all times. My interactions with community members are almost always in isiXhosa - they insist they will not speak English with an Nguni speaker, as I am Ndebele.

> The SLL participants all know that I am a call or sms away, and my day to day includes, *inter alia*, managing the logistics of the project, dealing with remote diagnosis of field site infrastructure, literacy training and helping community members to solve any IT difficulties they are experiencing.

I also plan, coordinate and organise the logistics for the tri-monthly field trips for the researchers from Fort Hare and Rhodes to the field sites in Dwesa. Wherever possible I call on them to assist with the logistics in order to simplify these trips.

At present, I am working with approximately 20 Masters and PhD students who are dedicated to computer literacy training at the Dwesa sites and who undertake

two trips a month on a rotational basis. Each student is required to be present in the field at least 3 times, over a period of 6 months. There is no other way to know your community, other than spending time with them. At the same time I encourage the community to assist the students with their research and to participate in the proof of concept eService development.

> After all, this is a mutual learning and sharing initiative where the researchers want to learn more about the community, and the community wants to learn from the researchers.

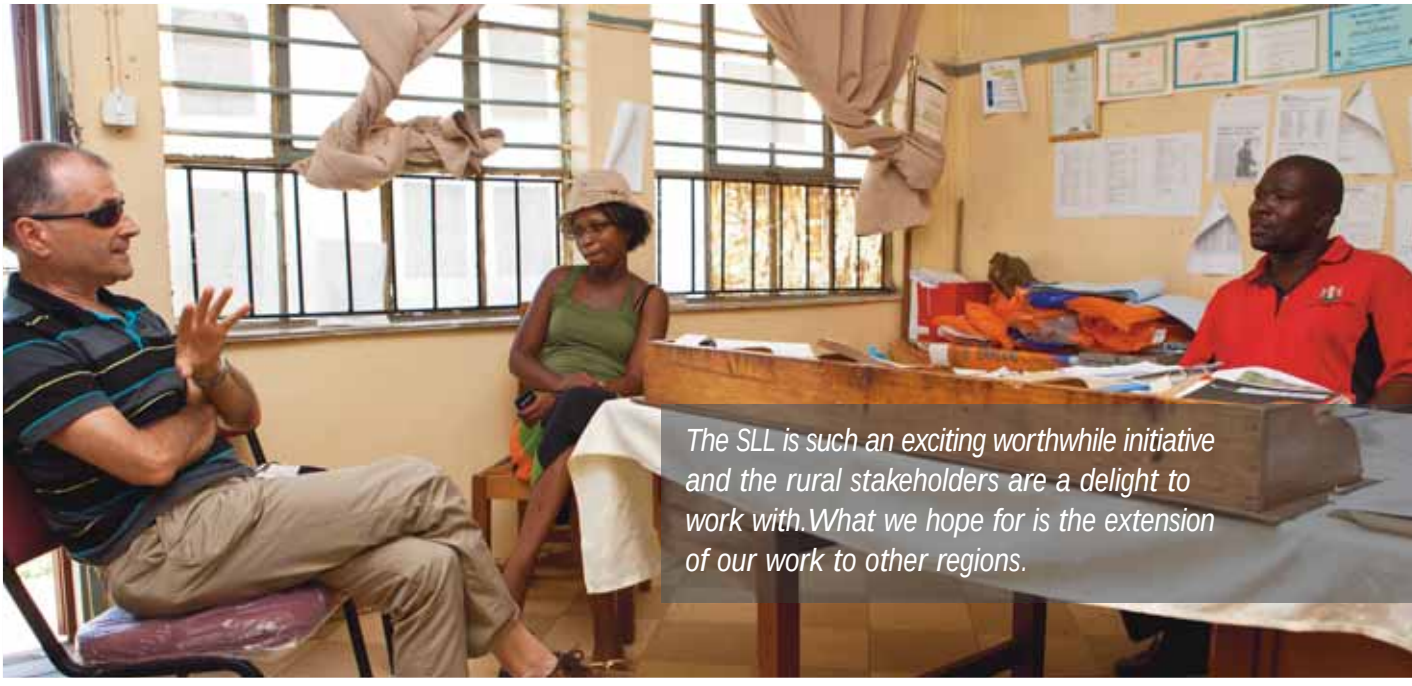
The SLL is part of the Living Lab networks in Southern Africa and Europe. It became a member of the European Network of Living Labs (ENoLL) in 2008 and is one of the founding members of the Living Labs in Southern Africa (LLiSA) network, established at the beginning of 2009. Relationships with other Living Labs promotes networking and sharing of best practices.

In 2011, the SiLLMU organised a successful LLiSA workshop, which contributed to a white paper supporting the evolution of sustainable Living Labs and Living Lab networks in Africa. I have participated in several workshops and conferences and in provincial, national and international platforms, on the use of the Living Lab model as a method of bringing sustainable ICT for development to rural areas, with increased innovation potential.

The SiLLMU is also responsible for marketing of the SLL to various bodies, from district to national level. I work very closely with the Education District Officer in Dwesa who oversees most of the schools where the SLL initiative is based. I also keep the Department of Education District eLearning division informed about our activities.

At a provincial level the SiLLMU has engaged the Eastern Cape Premier's Office and also the eSkills Hub based at Walter Sisulu University. At a national level, SiLLMU has forged ties with national departments and helped to organise the visit in 2009 of the Deputy Minister of Science and technology Mr Derek Hanekom to a SLL Digital Access Node in Dwesa.

The SLL is such an exciting, worthwhile initiative and the rural stakeholders are a delight to work with. What we hope for is the extension of our work to other regions.



The SLL is such an exciting worthwhile initiative and the rural stakeholders are a delight to work with. What we hope for is the extension of our work to other regions.

Ms Lindelwa Jongidiza demonstrates how the traditional, rural community of Dwesa is now plugged into the world.

The SLL's TeleWeaver applications include eCommerce support to sell local products and services.

SLL supports local businesses (art and craft production, B&B and other micro-tourism activities) through a platform, that is being expanded to encompass a variety of other eServices.

Dwesa has a rich isiXhosa cultural heritage. One of the SLL's goals is to grow the community's eCommerce skills in order to showcase their tradition and products to the global market through their own website and earn a living through eCommerce sales.

Realising the full potential of the Siyakhula Living Lab

The Siyakhula Living Lab (SLL) is now expanding into the peri-urban areas of Grahamstown and Alice to have reference models for both the township and rural realities of marginalisation. This will offer a nearly complete spectrum of disadvantaged communities in South Africa.

"To grow the SLL installation and the supporting systems (human and operations) to a point where it will be useable by the many entities interested in process and product innovation for marginalised communities, we need to invest extra resources beyond what the two Universities and their respective Telkom Centres of Excellence can muster," says Professor Alfredo Terzoli.

Mr Synford Ndinisa and learners at Ngwane Junior Secondary School, Dwesa, which now has more than 30 computers through the Siyakhula Living Lab.

This document outlines a three-year plan to achieve this.

Below is a summary of the goals, already achieved outcomes and future objectives of the Siyakhula Living Lab:

Goals

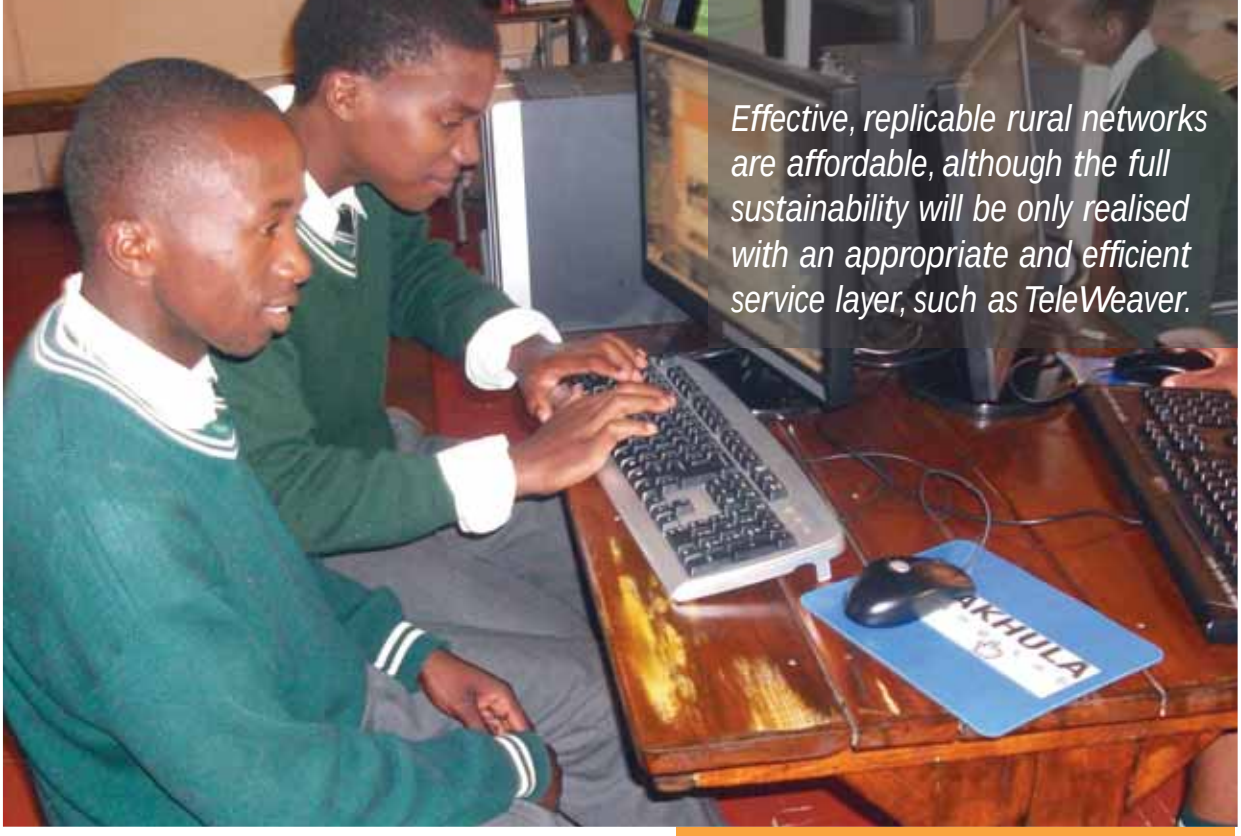
Short-term (1-2 years): Build direct benefits

- Development of an effective, low maintenance service-oriented network infrastructure;
- Learner and adult training in computer use, promoting the emergence of local training champions;
- Offer new services to the community that can directly save costs and support local economic activity, both on fixed and mobile terminals. SLL supports local businesses (art and craft production, Bed and Breakfast and other micro-tourism activities) through a platform, that is being expanded to encompass a variety of other eServices, including eLearning, eHealth, eGovernance);
- Involve researchers in real life research work, reflected by the research output.

Medium-term (3-5 years): Network the community and build a bridge to the knowledge society

Continue the work activities as in the previous phase with emphasis on:

- Bringing the telecommunications network into community homes - demonstrate benefits and speed up adoption, including eCommerce;
- Start a software production centre Reed House Systems (www.reedhousesystems.com) that could industrialise the software prototypes developed in the Siyakhula Living Lab;
- Offer effective entry into a networked and 'research-primed' marginalised community to government departments, companies (large or small) and NGOs wanting to develop new process or products for marginalised communities;



Effective, replicable rural networks are affordable, although the full sustainability will be only realised with an appropriate and efficient service layer, such as TeleWeaver.

- Developing a scalable, standardised model for similar areas in Africa and other developing countries.

Long-term (6-9 years): Activate full participation in the knowledge society

- Most community households networked and active in the knowledge society;
- The involvement of the community as innovators reaches maturity. The model is replicated on a large scale in other marginalised areas in southern Africa and Africa.

Outcomes already achieved

The following are the outcomes that have been realised within the SLL project, through annual funds obtained from the Telkom Centres of Excellence.

They illustrate that effective, replicable rural networks are affordable, although the full sustainability will be only realised with an appropriate and efficient service layer, such as TeleWeaver.

Infrastructure and services

- Established what is probably South Africa's first rural WiMAX network in early 2006 in the Dwesa region, now upgraded to handle mobility, thanks to Saab Grintek Technologies;
- Provided Internet connections to 17 schools (Digital Access Nodes, DANs) in the Dwesa region, which act as points of access for the wider community;
- Established a base for researchers to reside in the Dwesa region during their field work;
- Networked and connected to the Internet eight schools in the township of Grahamstown, with a further four in the pipeline;
- Set up Reed House Systems, currently hosted by Rhodes and Fort Hare but ready to be spun off;
- TeleWeaver, the main product of Reed House Systems, is now accessible from the DANs, with a growing set of relevant applications;
- Developed a blue-print for cost-effective DANs.

General support

- Ongoing maintenance of the network and computer facilities;
- Ongoing project facilitation in the community;
- Partnered with external entities (industry and government);
- Networking and marketing.

Future Objectives

As said above, the Siyakhula Living Lab would greatly benefit from engaging with the provincial or national government in upgrading the current SLL implementation over the next three years.

The following is an initial view of the future objectives required over a three years period to reach its full potential.

Learners from Nqabara Senior Secondary School, Dwesa.

Caption

Year 1

- Upgrading of five of Siyakhula Living Lab DANs in Dwesa and one in Grahamstown township, along the lines of the SLL model lab at Ngwane Junior Secondary School in Dwesa;
- Hiring of two additional staff members for the Siyakhula Living Lab Management Unit (at the moment there is one staff member) to coordinate the expansion activities as well as the marketing of the Living Lab to interested parties.
- Hiring of two members of the local community in Dwesa and one in Grahamstown, who will be the point of reference of the SLL directly in the areas;
- Start promoting the idea of the SLL as a point of experimentation for all entities interested in marginalised communities.

Year 2

- Upgrade of five more of Siyakhula Living Lab DANs in Dwesa and two in Grahamstown, to reach full capacity;
- Further the marketing of the SLL, promoting the concept of a Living Lab as a place for process and product innovation.The goal is to attract various entities interested in using the SLL to design or re-design processes and products targeting marginalised segments of the population.

Year 3

- Upgrade the last six Siyakhula Living Lab DANs in the SLL installation in Dwesa and two in Grahamstown;
- Full marketing of the SLL to appropriate entities, now more on a commercial basis to generate a revenue stream from giving access and support to entities interested in developing processes and products for marginalised segments of the populations.

Note that the Living Lab will grow well into a future where the population in which the SLL DANs are located will be increasingly less marginalised, and ultimately reconnected to the economic and social life of the rest of the country.

The Living Lab will be equipped to tackle any new problems that this new reality will bring. In other words, the Lab will not become obsolete, as has been proved by the active presence of Living Labs in many developed countries.

The SLL's technology mix can be adapted to each community's specific needs and circumstances.

The Telkom Centre of Excellence is a strong example of a triple helix at work, where academia, industry and government come together to pool resources and improve the competitiveness of the industry.

Visit in 2009 of the Minister of Science and Technology Mr Derek Hanekom to a SLL Digital Access Node in Dwesa.

15 Years of Excellence

By Sarah-Jane Bradfield

In 2012, Rhodes University's Telkom Centre of Excellence in Distributed Multimedia - a partnership with Telkom and the South African Department of Trade and Industry - celebrates 15 years of growing local telecommunications and information technology skills, promoting a culture of excellence in research in Information and Communication Technologies (ICT), and providing facilities to encourage young scientists and engineers to pursue their interests in South Africa.

Rhodes University has hosted a Telkom Centre of Excellence since the inception of the initiative in 1997 and was the first Centre to be hosted in a Computer Science department.

The Centre focuses on distributed multimedia and brings together the research expertise within the department, contributions from other departments at Rhodes University and at other tertiary institutions, both nationally and internationally, and input from industry partners.

In addition to developing skills in science, engineering and technology, the Centres are aimed at creating partnerships between historically disadvantaged and advantaged institutions. The institutions were initially paired, with a previously disadvantaged and an advantaged institution sharing a Centre in which to jointly focus on a specific aspect of telecommunications research. This provided for the transfer of skills and the upliftment of the previously disadvantaged institution.

Besides Telkom, its anchor partner, the Centre is supported by Tellabs, GENBAND, Easttel, Bright Ideas Project 39, and both the Department of Trade and Industry (DTI) through THRIP and the National Research Foundation (NRF). The Centre operates under the management of a joint academic/industry steering committee, and has high-level representation from the partner industries and from the DTI through the NRF.

According to the Head of Rhodes University's Centre of Excellence, Professor Alfredo Terzoli, it is a strong example of a triple helix at work, where academia, industry and government come together to pool resources and improve the competiveness of the industry, via the preparation of highly skilled practitioners and the co-development of appropriate technology.

With the recent addition of end-users of telecommunication solutions, the programme now embodies a quadruple helix approach, which Prof Terzoli believes adds enormous value. Significant increases in the number of academic publications and postgraduate numbers are some of the Centre's notable achievements to date, he said.

There are 16 Telkom Centres of Excellence, each hosted by a tertiary education institution. Together they constitute the biggest Research/Development/Innovation initiative in ICT in South Africa.

Mr Mzimasi Jiya Ward Councillor in Dwesa discussing the critical need for computer skills in the community.

The Computer Science and Information Systems postgraduate students from Rhodes and Fort Hare have maintained an ongoing presence in the Dwesa community for the past seven years.

The Telkom Centre of Excellence is a strong example of a triple helix at work, where academia, industry and government come together to pool resources and improve the competitiveness of the industry.

The Internet in rural communities: unrestricted and contextualised

Mamello Thinyane[1], Lorenzo Dalvit[3], Peter Clayton[2] and Alfredo Terzoli[1]
[1] Centre of Excellence, University of Fort Hare, Alice, South Africa
[2] Centre of Excellence, [3] School of Languages
Rhodes University, Grahamstown, South Africa

Abstract

The benefits of the Internet are still not available to many marginalised communities because of lack of connectivity, costs of infrastructure and scarcity of skills.

Many ICT for Development (ICT4D) projects offer piecemeal interventions relying either on restricted (and often decontextualised) access to the Internet or on isolated Local Area Networks (LANs). In this paper we argue that marginalised rural communities should have unrestricted access to the Internet in order to exploit its full potential. We also believe that the Internet could be contextualised through an optional adaptation layer which would facilitate access.

We discuss an ICT4D project which was shaped from the very beginning according to these principles. It involves the deployment of an eCommerce platform (soon to be integrated with eHealth, eLearning and eGovernment capabilities) in a rural community in South Africa. We report on how the various components of this intervention fit into the model, and the benefits for the community.

Keywords: ICT for Development, eSociety

Introduction

The proliferation of the Internet has provided distributed and open access to information to many people. The traditional information channels (print, television, radio) are typically unidirectional and enforce a strong separation between the role of those who consume and that of those who produce information. Those who participate in the mass distribution of information gain more power, while those who are excluded from it become more and more marginalised [1]. This is possible partly because the traditional information enterprises are associated with prohibitive capital costs. The only people with a voice are those with power and resources.

On the Internet, information sources are decentralised and there is high competition. Web 2.0 tools made it possible for everyone who has access to the Internet to become a contributor and a producer of knowledge in an easy manner [2]. The proliferation of personal blogs and the success of public wikis confirm the open and distributed nature of knowledge production and sharing on the Internet. The Internet architecture provides a leveled knowledge dissemination platform regardless of social status and, to a large extent, of political or economic power. From the invention of the printing press by Gutenberg in 1463 to the 21st century Web 3.0 tools, information production has become progressively less centralised, more accessible and diversified [3]. The overall impact of the Internet has cascaded into every aspect of life: communication, health, education, business and governance. The total value of annual eCommerce transactions in United States of America is estimated at more than $120 billion [4]. The economic benefit of the Internet to society cannot be over emphasised.

From the social perspective, however, the main concern becomes the issue of participation in this new knowledge economy. The UN expressed the concern that “the information technology gap and related inequities between industrialised and developing nations are widening: a new type of poverty information poverty looms. Most developing countries, especially the Least Developed Countries (LDCs) are not sharing in the communication revolution” [5]. This widening gap between those who enjoy the benefits of digital and Information Technology, and now the Internet, and those who do not has been termed digital divide and has been the subject of many

discussions, studies and interventions [6]. Traditionally, the main causes of the digital divide are lack of connectivity, infrastructural costs, and lack of capability and skills within the target communities. The interventions that have been undertaken to bridge the digital divide have therefore focused extensively on providing connectivity, subsidising infrastructure and undertaking skills development and training.

While we agree that physical connectivity and education are sine qua non conditions, in this paper we argue that interventions aiming at bridging the digital divide should include ethnographic considerations and be sensitive to cultural aspects that currently make the Internet unusable, irrelevant and foreign to many marginalised communities. The next section discusses some ICT-for-Development (ICT4D) projects and highlights the limitations in their implementation. The paper then presents the proposed intervention strategy and introduces the components of a bidirectional adaptation mechanism that aims at making the Internet relevant for a specific type of marginalised communities (i.e. rural communities). The ultimate goal is to make them active contributors and participant to the eSociety, the way communities with more power and resources are. The practical implementation of the model is discussed in the context of a project undertaken in Dwesa, a rural community in South Africa. The paper concludes by discussing the benefits of the intervention strategy and how it makes the full potential and advantages of the Internet accessible to this particular rural community.

ICT4D Intervention (as we know it)

The implementation of ICT4D projects was encouraged by the publication of the Millennium Development Goals (MDG) by the United Nations. The MDGs include eight goals to be achieved by 2015, that respond to the World's main development challenges [7]. The first of the eight MDGs, aligned with ICT4D interventions, is the eradication of extreme poverty and hunger. From a report that was released by the United Nations on 2nd July 2007 (approximately half way to the target), opinions about progress are mixed [8]. The majority of poor rural areas are characterised by lack of infrastructure (i.e. road networks, communication etc.) and basic services (i.e. water, sewage etc.). ICT4D projects are therefore predominantly implemented in the context of such infrastructural and social degradation. In an attempt to bridge the digital divide, different projects undertake to address the specific barriers to ICT access in rural areas.

One of the primary barriers addressed in ICT4D projects is the connectivity barrier. Public service delivery is typically very poor in rural communities, and connectivity to wired telecommunication networks is often nonexistent [9]. For this reason, some projects have implemented wireless networking solutions, such as Very Small Aperture Terminal (VSAT), WiFi and now WiMAX. One other barrier to ICT establishment in rural communities is lack of electricity, and this has sometimes motivated the use of solar energy as an alternative power source [10]. Other ICT4D projects focus on addressing the barrier posed by lack of skills, by undertaking training and skills development [11].

There are also projects that address the barrier posed by the costs of technological equipment by developing lowcost, entry level devices for deployment in rural areas. One Laptop Per Child (OLPC) [12] and Aleutia [13] are examples of such activity. Besides implementations that address general barriers to ICT access, some ICT4D projects provide ad hoc solutions to specific social institutions: eLearning solutions for education institutions [14][15]; eHealth for clinics [16][17]; and eCommerce for businesses [18]. Most ICT4D intervention subscribe to a particular paradigm (i.e. social, technological, economic, structural or cultural paradigm) [19]. An intervention undertaken within an economic paradigm would predominantly tend to propose an eCommerce solution, within a structural paradigm eGovernment solutions would be proposed and within an educational / cultural paradigm eLearning solutions would be proposed.

In our opinion, one of the limitations in many ICT4D projects is a restricted, adulterated and decontextualised strategy for Internet connectivity, which does not make the Internet their central focus both as a resource and as a culture. Such interventions may work well within the constraints of their implementation, but limit the participation in the global eSociety for the target communities. This perpetuates information marginalisation and exclusion from the full advantages of the Internet. To illustrate the point, consider a project undertaken to provide ICT solutions for rural health systems, as in [17][20]. In the implementation of this project, a LAN between the clinics in the community and a backhaul link to the supporting hospitals was deployed. Such intervention has important limitations, because of its 'closed' nature. Firstly, it does not take into consideration the possibility of using the deployed network to support other societal activities, besides health provision. This limits innovation (both as a resource and a culture) and makes the infrastructure more expensive in the long run. In fact, a system deployed outside the Internet ecosystem needs, at a very least, ad hoc maintenance if not complete implementation. This results in having a few individuals who know how to use the health system (i.e. nurses and health workers), but not in a widely eLiterate

community that could be involved as peers and participants in the global eSociety.

Intervention (as we see it)

As pointed out by [21], one can say that, paradoxically, the digital divide starts once one is connected to the Internet. In fact, besides physical access to the Internet, marginalised communities must be given epistemological access. One of the primary tenets of the discipline of ethno-computing is the realisation of culture-specific influences on computing and subsequently on the Internet [22]. The Internet grew out of the collaboration of different individuals and groups, each contributing to shape it according to their world-view and culture. Although the result was the emergence of a new and original eCulture, some of these influences affected the way the Internet works today more than others. The computer world and the Internet have been shaped primarily by the dominant (Western) culture. An example of this can be found in the very layer most people use to access their computing resources, the Graphical User Interface. The metaphor of desktop, folders, files, and documents to refer to the organisation of the information in a computer is clearly derived from office life, where files and documents are organised in folders, and the work is done at a desk. This is intended to make computers and the use of the Internet more accessible and intuitive, drawing on the everyday experience of people who are familiar with office environments. However, most people in rural communities are not familiar with an office environment and this metaphor, far from being helpful, is likely to further confuse them.

So, consistently with dependency theory [23], a decontextualised and Euro-centric approach, which does not integrate Internet into people's daily lives, risks to further disadvantage rural communities that are already marginalised in many other ways. We situate our proposed intervention strategy within this premise. We argue that for rural communities to be active participants and peers in the global eSociety, adaptation mechanisms and interfacing strategies have to be implemented. These adaptation mechanisms can facilitate access to the Internet for members of rural communities, in a manner that is immediately relevant and positioned within their cultural and cognitive framework. At the same time, it is important that this does not become the only access mechanism, not to strangle the potential for self-driven discovery, interaction as well as active and innovative participation which are the quintessential characteristics of the Internet (Figure 1).

The nature of the adaptation mechanism we envisaged is bidirectional. Some aspects of the Internet are contextualised, i.e. adapted and situated within the usage framework of the rural communities. Conversely, the community's culture, world-view and way of life are reshaped and partly transformed by the access to the Internet. The following characteristics of the Internet underpin our intervention strategy. The Internet is:

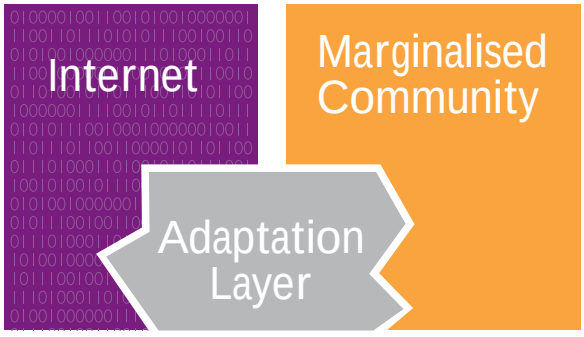


Figure 1. Adaptation Mechanism

- Open and distributed - The Internet is open and accessible to anyone with connectivity. It is a distributed system, which makes it difficult for anybody to take full control of it. In this sense, the Internet is free precisely because it belongs to everybody and to nobody at the same time.
- Diversified and contextualised - The Internet fosters an environment for diversity. This extends from the protocols and standards used to the available content. The kind of content available reflects the composition of the community of Internet users and, perhaps most importantly, their level of participation and active contribution.
- Participatory - Once technology is put in place, its utilisation is appropriated by the users based on their needs and the value they derive from it. Although the majority of Internet users are traditionally consumers of knowledge, Web 2.0 tools enable everybody who has connectivity to become an active knowledge producer.

The context in which the proposed intervention strategy is put to test is Dwesa, a rural marginalised community in the Eastern Cape province of South Africa. Dwesa has a population of approximately 15000 people living in 2000 households. The inhabitants of Dwesa are traditionally subsistence farmers who depend on their crops for livelihood. The region has a rich Xhosa cultural heritage [24]. Dwesa is the site of a project that is undertaken between the University of Fort Hare and Rhodes University, to implement ICT4D solutions [25]

[26] [27]. An eCommerce platform has been deployed to market local tourism, artcraft and music [28] [29] [30]. As part of the intervention, a VSAT connection to the Internet was provisioned, which was then distributed in the community via a WiMAX network [31]. This provides the basic connectivity to the Internet as the underlying infrastructural requirement for the implementation and testing of adaptation mechanisms. The local WiMAX network also supports telephone communications with a Voice over Internet Protocol (VoIP) Private Box Exchange (PBX) [32]. The infrastructure is based on Open Source Software (OSS). Besides addressing the affordability barrier, this also allows for more complete sourcecode level customisation and adaptation of the software deployed. OSS also presents the possibility for the local community to participate in the software development process in the future and potentially start a software industry in one of the most 'unexpected' places. In the collaborative spirit which characterises our intervention, the five components listed below were implemented according to the feedback from the community by a team of developers most of whom come from a similarly marginalised background [33].

Cultural Localisation

Localisation of the Internet tools and application to fit the cultural framework of a rural community involves adaptation along the following dimensions.

- Metaphors - how people make sense of the world differs on the basis of their background and social context. As a simple example, in the Xhosa culture the metaphor of a 'bag' or 'sachet' might be more appropriate for a container of smaller items (files and documents) than a 'folder'. The use of metaphors as representation and articulation of reality permeates every aspect of computing. Identifying the key metaphors involved in the use of the Internet and finding relevant Xhosa equivalents is a way of making interfaces more accessible and intuitive.
- Interaction framework - the primary modes of communication within a culture influence how that culture approaches interaction with a computer. Some cultures are more predisposed to communicate through music, dance or songs, while others communicate primarily through written text [36]. In order for the Internet and computing to be culturally contextualised, a provision has to be made for the interaction modes that are most appropriate for a particular community. As an example, "put that there" input modality [37] might be more appropriate than a textbased input modality for a community with a strong oral tradition and comparatively low levels of literacy.
- Application themes - in different cultures conceptualisation of perfection in form and structure differ [34]. Different colors and shapes are interpreted differently in different cultures. The positioning, alignment and use of symmetry for interface components differs as well for different groups of people [35]. Gaining a deeper understanding of these cultural markers is a focus area in our intervention. Discovering the relevant thematic elements in the Xhosa culture can guide the adaptation of interfaces to suit the taste of the local community.

Indigenous Knowledge Integration

The key advantage of Internet connectivity for a community is the access to relevant knowledge. This can be either knowledge which is already available globally or knowledge which is produced and disseminated locally. We strongly believe that, in a rural community, the Internet infrastructure should explicitly cater for the capturing and codifying of indigenous knowledge [30]. This can increase the amount of locally-relevant knowledge on the Internet and contribute to make it more sensitive to the context and culturally relevant. There is, however, a need for a strategy to structurally enable and facilitate the indigenous knowledge capturing, codifying, preserving and sharing.

The strategy we are currently implementing involves developing multimedia ontologies that are accessible in a multimodal context [38]. Ontologies add semantic and automatic processing of information on the Internet, which increases efficiency and offers various other advantages [39]. The four ontologies that are currently being developed for Dwesa are for health, commerce, agriculture and Xhosa traditional culture. The ontology-based framework also allows for integration with existing ontologies, either by merging or aligning. As an example, the health ontology, which captures the indigenous knowledge around health and medicine, could be merged with LinkBase ontology [40], openGALEN ontology [41] or the Foundational Model of Anatomy (FMA) ontology [42].

Billing System

A key feature that must be considered in ICT4D interventions is sustainability. The Brundtland Report defines sustainability in the context of development as the "development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs" [43]. One of the key considerations of sustainability is financial sustainability. Interventions such as ours must be properly contextualised within the economic systems of the respective rural community. The costs of implementing and maintaining

access to the Internet in rural communities must be shared fairly according to the reference system of the communities. In an individualistic society (such as the most Western ones), payment according to usage is considered fair. In a collectivist society, where costs are generally shared among the community, charging a flat monthly usage fee would be more appropriate. We are developing a modularised cost-management system with a pluggable billing module interface. The billing modules capture the understanding within the community of how to best charge for the usage (for example, usage-based rate vs flatrate) [44]. The basis for the implementation of the billing modules is an understanding of socio-economic dynamics in the community. Therefore, the matrices take into account socioeconomic indicators such as number of dependents, annual gross earnings, etc. Some modules might need to take into consideration the total revenue that individuals or groups have derived from the Internet in the billing period, either directly from eCommerce type of applications or indirectly, through benefits such as the reduction of travel costs to obtain and fill government forms.

Computer Training

In the introduction section of this paper, we indicated how lack of skills is one of the barriers to penetration of ICT in rural communities. Our intervention strategy is not to do extensive training on specific tools and applications, but rather to equip and empower the communities with the skills for accessing and using the knowledge available on the Internet. The training focuses on activating selfdriven learning, and encouraging a culture of learning within the community. As a starting point we adopted the relatively common "train the trainers" approach. We identified champions in the community and undertook training to provide them with a basic level of computer literacy (understanding computing concepts, using peripheral devices, high level overview of application software) [45]. We relied on a focused, intensive, curriculum based on OpenICDL [46]. Once the initial champions were trained, they continued an iterative cycle of "training other trainers". This ensures that eLiteracy filters organically through the community. With some degree of flexibility, it also allows for learning that is self-driven and that is specific to the interest area of the individuals in the community. We also documented and addressed the specific issues emerged during the adoption process [47].

Linguistic Localisation

Many ICT4D interventions do not take into account the fact that most members of marginalised communities such as Dwesa are not proficient in English, the dominant language in the field of technology. This has proved to be an important aspect, since ICTs, besides being to a large extent foreign to the local culture, also function in a foreign language. One of the primary adaptation components we have undertaken is linguistic localisation of tools and applications, to make them accessible to all members of the community. This required the collaborative efforts of language experts, researchers, Xhosa-speaking computer experts and the local community. Efforts so far include:

- User interfaces - Thanks to the efforts of organisations such as Translate.org.za [48], it is already possible to operate a computer almost entirely in Xhosa. Although the quality of the translations is not always perfect, the goal is to disseminate their use as widely as possible and get the community to actively contribute with feedback. The user interfaces of most of the tools we create are also being localised into Xhosa [49].
- Teaching material - Due to low English proficiency in the area, part of the training had to be carried out in the local language in order to be effective. For the same reason, material for the teaching of computer literacy has been partly rewritten to suit the local context, and is soon to be translated. A glossary of computer terms translated, explained and exemplified in Xhosa is already available both in print and online [50] [51] [52].
- Online content - Part of the content of the ontologies is currently being translated and will ultimately be available in both English and Xhosa. As an example, information material about health (particularly HIV/AIDS) will be made available in the local language to reach as wide an audience as possible. Likewise, Indigenous Knowledge about health will be codified and made available in both English and Xhosa. This will make it accessible to Xhosa speakers in other parts of the country as well as the global community [53]. Through unrestricted access to the Internet, the Dwesa community can also access and contribute to large international projects, such as the Xhosa section of Wikipedia.

Implementation

Figure 2 specialises Figure 1, summarising the various components currently under development. The list of the components of the adaptation layer is by no means exhaustive.

It only corresponds to the first areas within the Dwesa project that needed adaptation in order to contextualise the use of the Internet in the community. The model is built to allow growth and be flexible enough to be applied in a wide range of contexts.

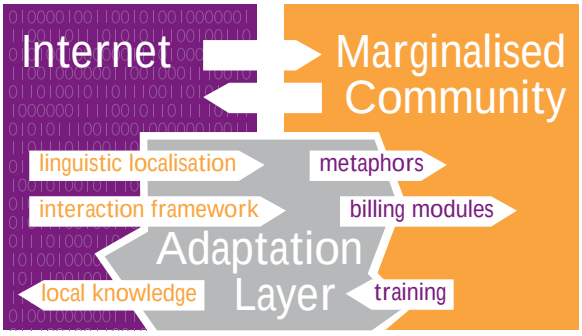


Figure 2. Adaptation Components

As shown in Figure 2, the adaptation layer should not become the only interface between the community and the Internet, but should rather complement and, wherever appropriate, mediate unrestricted access to the Internet. This can be shown by what came to be known among the researchers involved as the 'pigs' example [25]. Sometime before the beginning of our intervention, most pigs in the Dwesa area had to be suppressed because of an outbreak of swine fever. The government promised compensation but nobody in the community knew which procedure to follow in order to claim the money. Once Internet connectivity was brought to Dwesa, members of the community were able to find the online forms and description of the procedure for the claim. In our opinion, this is a clear example of how only unrestricted access realises the full potential of the Internet, in ways that could not possibly be foreseen by ICT4D projects implementers.

It should be noted that our model interprets what happens spontaneously in the case of most communities of Internet users in developed countries. In most cases, such communities have the means and resources to influence and shape the Internet to suit their needs. We feel that, in the case of marginalised communities, this process needs to be made explicit and requires a conscious and focused effort.

Our model seeks to provide scaffolding for communities who are new to the use of technology to become acquainted gradually, without restricting participation and full access. In order to avoid a paternalistic top-down approach, the intervention is entirely driven by the members of the target community themselves, in collaboration with a team of developers who share the same socio-economic background.

Conclusion

The potential of the Internet to bootstrap development in rural communities has been documented extensively [6]. In order for this potential to be realised, we believe that the full extent of the Internet has to be made accessible to rural communities. ICT4D projects that focus on one communal activity (health, governance, etc) in special 'walled gardens' stifle and limit the full benefits of Internet in rural communities, and do not activate participation in the global eSociety. On the other hand, access to the Internet can be partly mediated and complemented by adaptation layers specifically designed for the target context. The implementation of an adaptation layer to the Internet for rural communities, currently used in an ICT4D project in rural South Africa, is discussed above. Such an approach has proved to be beneficial in promoting participation of marginalised communities on the Internet. Unrestricted access and contextualisation emerged as key success factors.

Acknowledgments. The financial assistance from the Andrew Mellon Foundation is hereby acknowledged. This work is undertaken in Telkom Centres of Excellence at Rhodes University and University of Fort Hare.

The UN has expressed the concern that the information technology gap between industrialised and developing nations is widening. The Siyakhula Living Lab addresses this.

References

1. McChesney, R.: *Corporate Media and the Threat to Democracy*, Seven Stories Press (1997).
2. Korica, P., Maurer, H., Schinagl, W.: *The Growing Importance of eCommunities on the Web*, Proceedings of the IADIS International Conference on Web Based Communities, San Sebasitan, Spain (2006).
3. Giles, M.: *From Gutenberg to Gigabytes: Scholarly Communication in the Age of Cyberspace*, The Journal of Politics, vol. 58, pp. 613626 (1996).
4. Herin, J.: 'Digital Trust' *Essential to Enterprise Business Prosperity*, Says CSC Report, Computer Sciences Corporation (28 June 2007).
5. United Nations: *Statement of the Administrative Committee on Coordination on Universal Access to Basic Communication and Information Services*, United Nations General Assembly (1997).
6. Chapman, R., Slaymaker, T.: *ICTs and Rural Development: Review of the Literature*, Current Interventions and Opportunities for Action ODI Working Paper (2002).
7. Millennium Development Goals: http://www.undp.org/mdg
8. Robinson, M.: *Millennium Development Goals are headed for failure*, Mail and Guardian, pp. 1319 July (2007).
9. Strover, S.: *Rural Internet Connectivity, Telecommunications Policy*, Elsevier Science, vol. 25, pp. 331347 (2001).
10. Lorenzo, E.: *Photovoltaic Rural Electrification*, *Progress in Photovoltaics Research and Applications*, vol. 5, pp. 327 (1997).
11. Huggins, R.: *The Digital Divide and ICT Learning in Rural Communities: Examples of Good Practice Service Delivery, Local Economy*, Taylor & Francis, vol. 17, pp. 111122 (2002).
12. One Laptop Per Child, *http://www.laptop.org*
13. Aleutia, *http://www.aleutia.com*
14. Slay, H., Wentworth, P., Locke, J.: *BingBee: an information kiosk for social enablement in marginalised communities*, SAICSIT '06: Proceedings of the 2006 annual research conference of the South African Institute for Computer Scientists and Information Technologists, pp. 107116, Cape Winelands, South Africa (2006).
15. Gush, K., Cambridge, G., Smith, R.: *The Digital Doorway: minimally invasive education in Africa*, ICT in Education Conference (2004).
16. Corr, P., Couper, I., Beningfield, S., Mars, M.: *A simple telemedicine system using a digital camera*, Journal of Telemedicine and Telecare, Royal Society of Medicine Press, vol. 6, pp. 233236 (2000).
17. Chetty, M., Tucker, W., Blake, E.: *Telemedicine using VoIP combined with a Store and Forward Approach*, Proceedings of South African Telecommunications Networks & Applications Conference, pp 5356, Stellenbosch, South Africa (2004).
18. Leatherman, J.: *Internet-Based Commerce: Implications for Rural Communities*, Reviews of Economic Development Literature and Practice, vol. 5 (2000).
19. Flor A.G.: ICT and Poverty: *The Indisputable Link*, Paper for the Third Asian Development Forum on 'regional economic cooperation in Asia and the Pacific' organised by the Asian Development Bank, Bangkok (2001).
20. Tucker, W., Blake, E., Marsden, G., Pearson, M., Westerveld, R.: *Reflection on Three Years of Rural Wireless Internet Protocol Communication Research and Fieldwork*. South African Telecommunications Networks & Applications Conference, Mauritius (2007).
21. Czerniewicz L.: *Cape of Storms or Cape of Good Hope*? Educational Technology in a Changing Environment. British Journal of Educational Technology, Blackwell Synergy, Vol. 35, Issue 2, Pp. 145158 (2004).
22. Tedre, M., Sutinen, E., Kähkönen, E., Kommers, P.: *Ethno-computing: ICT in Cultural and Social Context*, Communications of the ACM, ACM Press New York, NY, USA, vol. 49, pp. 126130 (2006).
23. Jung, J.Y., Qiu, J.L., Kim, Y.C.: *Internet Connectedness and Inequality: Beyond the 'Divide'*, Communication Research, vol. 28, No. 4, pp. 507 (2001).
24. Palmer R., Timmermans, H., Fay, D.: *From Conflict to Negotiation: Nature-Based Development on South Africa's Wild Coast*, Human Sciences Research Council, Pretoria, South Africa (2002).
25. Thinyane M., Slay H., Terzoli A., Clayton P.: *A preliminary Investigation into the Implementation of ICTs in Marginalised Communities, South African Telecommunications Network Applications Conference*, Western Cape, South Africa (2006).
26. Dalvit L., Thinyane M., Terzoli A., Muyingi, H.: *The Deployment of an ecommerce Platform and Related Projects in a Rural Area in South Africa*, 3 rd Annual International Conference on Computing and ICT Research - SREC 07, Kampala, Uganda (2007).
27. Dwesa project. *http://www.dwesa.org*

28. Njeje, S., Terzoli, A., Muyingi, H.: *Software Engineering of a Robust, Cost-effective Ecommerce Platform for Disadvantaged Communities*, South African Telecommunications Network Applications Conference, Western Cape, South Africa (2006).
29. Dwesa eCommerce platform: *http://dwesa.com*
30. Ndlovu, G., Terzoli, A., Pennels, G.: *Indigenous knowledge: a pathway towards developing sustainable ICT solutions*, South African Telecommunications Network Applications Conference, Western Cape, South Africa (2006)
31. Mandioma, M., Rao, K., Terzoli, A., Muyingi, H.: *A Feasibility Study of WiMax Implementation at DwesaCwebe Rural Areas of Eastern Cape of South Africa*, IEEE TENCON, Hong Kong, China (2006).
32. Whittington, B.,Terzoli, A.: *A Low Cost, IPBased Access Loop for Consumer Telephony in Rural Communities*, ICTe Africa conference, Nairobi, Kenya (2006).
33. Isabirye, N., Roets, R., Muyingi, H.: *Eliciting User Requirements for ECommerce Applications for Entrepreneurs in Rural Areas*. South African Telecommunications Network Applications Conference, Western Cape, South Africa (2006).
34. Barber, W., Badre, A.: Culturability: *The Merging of Culture and Usability*, Proceedings of 4th Conference on Human Factors & the Web, Basking Ridge, New Jersey (1998).
35. Sheppard,C., Scholtz, J.: *The Effects of Cultural Markers on Web Site Use*, Proceedings of 5th Conference on Human Factors & the Web, vol. 1, pp. 3, Gaithersburg, Maryland (1999).
36. Ong,W.: *African Talking Drums and Oral Noetics*, New Literary History, vol. 8, pp. 411429 (1977).
37. Bolt,A.R.: *Putthatthere: Voice and gesture at the graphics interface*, in SIGGRAPH '80: Proceedings of the 7th annual conference on Computer graphics and interactive techniques, ACM Press, pp. 262-270, New York, USA (1980).
38. Thinyane,M., Dalvit,L., Terzoli,A., Clayton,P.: *Towards a Model of an Ontology Based, MultiModal and Multimedia Knowledge Portal for Marginalised Rural Communities*, IEEE Information and Communications Technology International Symposium (ICTIS07) Conference, Fez, Morocco (2007).
39. Thinyane,M., Terzoli,A., Clayton,P.: *Engineering of a NextGeneration PIASK Based eCommerce Environment for Social Enablement*, South African Telecommunications Networks & Applications Conference, Mauritius (2007).
40. LinkBase Ontology, *www.landcglobal.com/pages/linkbase.php*
41. OpenGALEN Ontology, *www.openclinical.org/prj_galen.html*
42. Rosse,C., Mejino,J.V. L.: *A Reference Ontology for Biomedical Informatics: the Foundational Model of Anatomy*. Journal of Biomedical Informatics, vol. 36, pp. 478500 (2003).
43. Brundtland,G.H.: *Our common future*, Oxford University Press (1987).
44. Tarwireyi,P., Thinyane,M., and Terzoli,A.: *Implementation of an Internet Cost Management System for Disadvantaged Communities*, South African Telecommunications Networks & Applications Conference, Mauritius (2007).
45. Dalvit,L., Alfonsi,R., Isabirye,N., Murray,S., Terzoli,A., Thinyane,M.: *A Case Study on the Teaching of Computer Training in a Rural Area in South Africa*. 22nd Comparative Education Society of Europe conference, Granada, Spain (2006).
46. OpenICDL, *www.openicdl.org.za*
47. Mapi,T., Dalvit,L., Terzoli,A.: *A Case Study on the Adoption of ICTs in a Rural Area in South Africa*. African Science Communication Conference (ASCC), Port Elizabeth, South Africa (2006).
48. Translate, *www.translate.org.za*
49. Dalvit,L., Alfonsi,R., Mini,B., Murray,S., Terzoli,A.: *The Localisation of iLanga, a Next Generation PBX*. South African Telecommunications Network Applications Conference, Western Cape, South Africa (2006).
50. Dalvit,L., Murray,S., Terzoli,A. Zhao,X.: *Development of a WebBased Multilingual Resource for Equal Access to ICT Education in South Africa*. International Symposium on ICT Education and Applications in Developing Countries, Addis Abeba, Ethiopia (2004)
51. Dalvit,L., Murray,S., Terzoli,A.: *Development of Content and Interface for an OnLine Glossary of Computer Terms in isiXhosa*. Kenton Conference, Phumula, KwaZuluNatal, South Africa (2007).
52. Xhosa Online Glossary, *http://moodle.coe.ru.ac.za*
53. Dalvit,L., Kaschula,R., Mapi,T., Terzoli,A., Thinyane,M.: *Integrating ICTbased Indigenous Knowledge in the teaching of isiXhosa to Rhodes Unviersity pharmacy students*. Paper submitted for publication at the Kenton Conference, Phumula, KwaZuluNatal, South Africa (2007).

To activate the potential of the Internet to bootstrap development, the Siyakhula Living Lab team believes that the full extent of the Internet has to be made accessible to rural communities.

One of the primary barriers addressed by the Siyakhula Living Lab was the connectivity barrier.

"In a few years, the majority of Africans, Latin Americans, South Asians and people of other developing countries will have a small mobile computer at their fingertips - connected to the Internet"

The Siyakhula Living Lab helps community members in Dwesa to become active consumer and producers of knowledge.

The Long Way to the Net

The difficulty of connecting rural regions in South Africa to the Internet

By Dietrich von Richthofen

Die Zeit, a popular and prominent German weekly newspaper, published the following article titled 'Der lange Weg ins Netz' written by freelance journalist, Dietrich von Richthofen about the Siyakhula Living Lab and Reed House Systems.

http://www.zeit.de/2011/17/Living-Labs-Suedafrika

The English translation was featured in the June/July 2011 issue of The African Times. Dietrich visited Grahamstown and Dwesa at the beginning of February 2011.

When Sibukele Gumbo drives to her laboratory, she must cross a border. It is a border without a barrier, it does not separate states and it does not follow a well-defined line - only the road becomes a little more bumpy at Idutywa and leads deeper into the undulating grasslands of Wild Coast, a coastal county of the Eastern Cape Province in South Africa right in the middle of the former Transkei homeland.

"Welcome to information-locked country," says Gumbo, as we turn from the main road onto a rutted mud- and gravel road - welcome to the country that is excluded from the modern flow of information. The aim of the computer scientist is to dismantle this invisible border that runs between Wild Coast and the information society.

The next hill reveals a panorama view onto rolling hills where silvery-green grass is blowing in the wind. They are dotted with huts in light blue, mint green and bright purple. Cows and goats trot on narrow trails between them. But as idyllic as the landscape appears, as torn is the social and economic reality. During the apartheid era the black African population living in the homelands was largely excluded from the development of the rest of South Africa. Today up to 90 percent of the inhabitants in the region, who are by majority Xhosa, are unemployed or live from odd jobs. The average income - which mainly consists of pension payments, social assistance and remittances from economic migrants - is just a little more than 90 Euros per month. Supply of running water and electricity is the exception.

The flagship project has been offline for more than a week

Sibukele Gumbo and her colleagues from the Centre of Excellence of the South African telecommunications company Telkom SA aim to provide the local people with new opportunities for social and economic participation - by connecting them to global mobile phone and data networks. Therefore they set up a "Living Lab", a sort of test laboratory, where researchers develop innovations by involving the future users. The Siyakhula Living Lab - Siyakhula means "we grow together" in the local isiXhosa language - includes five schools and the villages in their catchment areas. All together an area of 25 square kilometers that is inhabited by 25,000 people.

Projects like this have already existed since the 1990s in certain parts of the world. However, with the rapidly increasing access to the Internet and mobile telephony in developing countries they can be implemented on a large scale nowadays. A real community has grown around the topic, global corporations like Nokia, Microsoft or SAP, multinational industrial and financial organisations, government institutions and countless start-ups and non-governmental organisations (NGOs) are involved. The abbreviation for the trend: ICT4D - Information and Communication Technologies for Development.

From health care, to economic inclusion, to education and democratic participation - for every issue on the development agenda one may find appropriate online applications.

Farmers sell their potato harvest by mobile phone via a trading platform directly to caterers. Slum dwellers coordinate their purchases by sending SMS to a central server. Microcredit is just a mouse click away. "The revolution in information technology is just starting," predicts Philippe Dongier, head of the sector Information

and Communication Technologies (ICT) at the World Bank. "In a few years, the majority of Africans, Latin Americans, South Asians and people of other developing countries will have a small mobile computer at their fingertips - connected to the Internet."

In Siyakhula Living Lab the hope for prosperity and growth is up to one single satellite dish on the roof of the Mpume Junior Secondary School. From there a WiMAX network, a kind of outdoor Wi-Fi, passes it on to the other four schools. Unfortunately, when we visit, the entire Living Lab has been offline for one week, Teressa Mqikela, a teacher in the Senior Secondary School in Ngwane, complains. Sibukele Gumbo and her colleagues came to restore the connection. They approach every school individually to detect the error. The car of the Living Lab is well known, people are waving cheerfully everywhere. The virtual connection to the rest of the world raises great expectations. Mqikela tells the the story of an 80-year-old man who rode his bike for several hours just to ask if he can send his grandson to her school. "Since we have been connected to the Internet the number of our students has doubled," she adds.

Cynthia Gxarisa is someone who already benefits from the connection. The mid-fifties woman sits in the staff room of the Junior Secondary School Mpume and places her phone on a weathered wooden table where tattered textbooks are piled up. Two years ago she did not know exactly what the Internet was - today she transfers money to her children and completes administrative formalities online. She has even registered her own business - a catering service for local schools - with the tax office via an online form. "This Internet is changing our lives," she says.

Gxarisa used to go to Dutywa for each transaction - about 70 kilometers upcountry. Because of the poor public transport connections and the terrible state of the roads, this usually took her a day. If she was out of luck and the bank was offline, she had to come back another day. "By using the Internet we save a lot of time and money," states Gxarisa.

But will the advent of modern communications structures bring sustainable growth? Proponents of ICT4D point to studies showing a correlation between the diffusion of communication technologies and economic growth. A report on the national development of Kenya published by the World Bank in late 2010 attributes almost 25 percent of the Kenyan economic growth to the rapidly growing ICT sector. Several long-term studies conducted in single regions seem to provide further evidence: Harvard economist Robert Jensen has already shown in 2007 that the dissemination of mobile networks can significantly increase the economic success of Indian fishermen. Equipped with mobile phones the fishermen could access information on the actual supply and demand in the ports and thus increase their profits on average by eight percent.

Yet computer scientist Kentaro Toyama is still sceptical. In his opinion Jensen's results are highly limited in their validity as they might not be applicable to other markets. "Market participants have easy access to various markets as they can call at different ports with their boats, the reality of most agricultural markets looks different," argues Toyama, who led the research group Technology for Emerging Markets at Microsoft Research India until 2009.

Today Toyama works at the School of Information, University of California at Berkeley, where he critically deals with ICT4D projects in development aid. For him the major mistake of many projects is the misbelief that technology could provide solutions on its own. Most people who are active in this field would come from backgrounds where a highly developed infrastructure, a functioning financial system, excellent logistics and the necessary skills in dealing with technology exist. "As a result many people tend to overlook the variety of factors that influence the success of a project in a different environment - from logistical issues about cultural differences to local political power struggles."

Toyama is no critic of the fundamentals. Nevertheless he believes that the money for most large scale projects, which for instance equip schools with computers for many millions of dollars, could be spent more efficiently by investing into the training of teachers and the acquisition of books. The failure to put the focus solely on new technologies were repeated cyclically, states Toyama and recalls the euphoria of the 1960s, when it was believed that television was the new magic bullet in the fight against illiteracy and the lack of education. "50 years later, we see that TV has done merely a

One Laptop per Child

A laptop for every child in the world, and this at a price of $100 - that was the idea Nicholas Negroponte presented at the World Economic Forum in Davos in 2005. Using the acronym OLPC (One Laptop per Child) for the project the notebooks should facilitate the entry into the computer age for the developing world and end the educational misery. Negroponte once stated that you can give a networked computer to a child and then leave it alone without worrying - as benefits will come on their own.

The delivery of the garish green, rugged machines with the name XO-1 started at the end of 2007 - though at a price of $200 a piece. According to the OLPC business model national governments are to buy the laptops. To date two million children around the world own an XO-1, which is about every thousandth child. 510 000 of them live in Uruguay, which has been the first country in the world that supplied all of its school children with the XO-1. In India, however, there are only 800 of these devices - as the giant country develops its own tablet computer for children, which is supposed to cost only 35e.

Anyway, the XO-1 became a top seller among trendy geeks in the U.S. and Europe in Christmas seasons 2007 and 2008. With the slogan "Give 1, Get 1" customers bought two units - one went to the third world, the other one could be kept as a unique lifestyle accessory. The OLPC project was criticised by third world activists as a technology-centric Western brainchild.

Just because laptops complement school lessons in developed countries this do not automatically apply to the rest of the world. Particularly in Africa the money could be spent more efficiently into a working school system. The project is also blamed for a lack of technical support - in many families the new toy is gathering dust in a corner after its owner had been frustrated by technical errors.

Christoph Drösser

marginal contribution - if any at all," says Toyama. His conclusion, "Technology can enhance existing skills and efforts - but cannot replace them."

There are groups in the ICT4D scene who want to learn from the mistakes of the past. One group is MobileActive, a New York-based network of activists whose aim is it to utilise mobile phones and the Internet for social change. Since last year the members have organised the FailFaire competition. In this competition it is not the best project that is awarded, but the one that failed most fundamentally - so to speak the Golden Raspberry Award for Internet-related development assistance.

Project managers present their failed projects and explain which mistakes have been responsible for the failure. The winner of the last meeting was Michael Trucano who is in charge of Information and Communication Technologies in Education and Training at the World Bank. He presented the ten biggest mistakes he has come across during his work with the World Bank and was awarded with an XO-1 - the minimalist notebook of the initiative One Laptop per Child (OLPC), which is seen by some as a prime example for a technology-centric, autocratic approach.

Alfredo Terzoli maintains a self-critical approach to success and failure as well. The head of South African Telkom Centre of Excellence is sitting in an Italian trattoria in the High Street in Grahamstown. From here - about 250 kilometers west of the Siyakhula Living Lab - the activities in the project are coordinated.

> "We technologists tend to regard technology as the solution," admits the native Italian who has spent 20 years in South Africa. It was therefore important to involve sociologists, anthropologists, linguists and representatives of other disciplines. "We must listen to what they have to say."

Terzoli deals with the difficulties openly. For example an online order for hand work has been received in Siyakhula Living Lab, the client wanted to have 140 necklaces. "When the day of delivery came, not even half were done - as there were no pearls remaining for

the rest," he says.

The predominantly English web is useless for many locals.

Numerous communication barriers have to be overcome. Many people in the area are illiterate, many only speak isiXhosa. "Imagine if the entire Internet was in Chinese and almost all content dealt with problems in China - then you get an idea of just how inaccessible and useless the network appears for many people here," says Terzoli.

An emphasis is therefore put on the training of 'champion teachers' which acquire skills in using computers and the Internet via special courses and later pass their knowledge on to students and other community members.

In addition, the programmers of Reed House Systems, a company that is also involved in the project, develop an online portal for the people in the Siyakhula Living Lab. It will be translated into isiXhosa and made available to illiterates via audio menus. The inhabitants of the region can create personal Internet profiles, communicate with other members, send information to state agencies, offer handwork for sale, search for jobs, design resumes for job applications or advertise their homes on tourist websites.

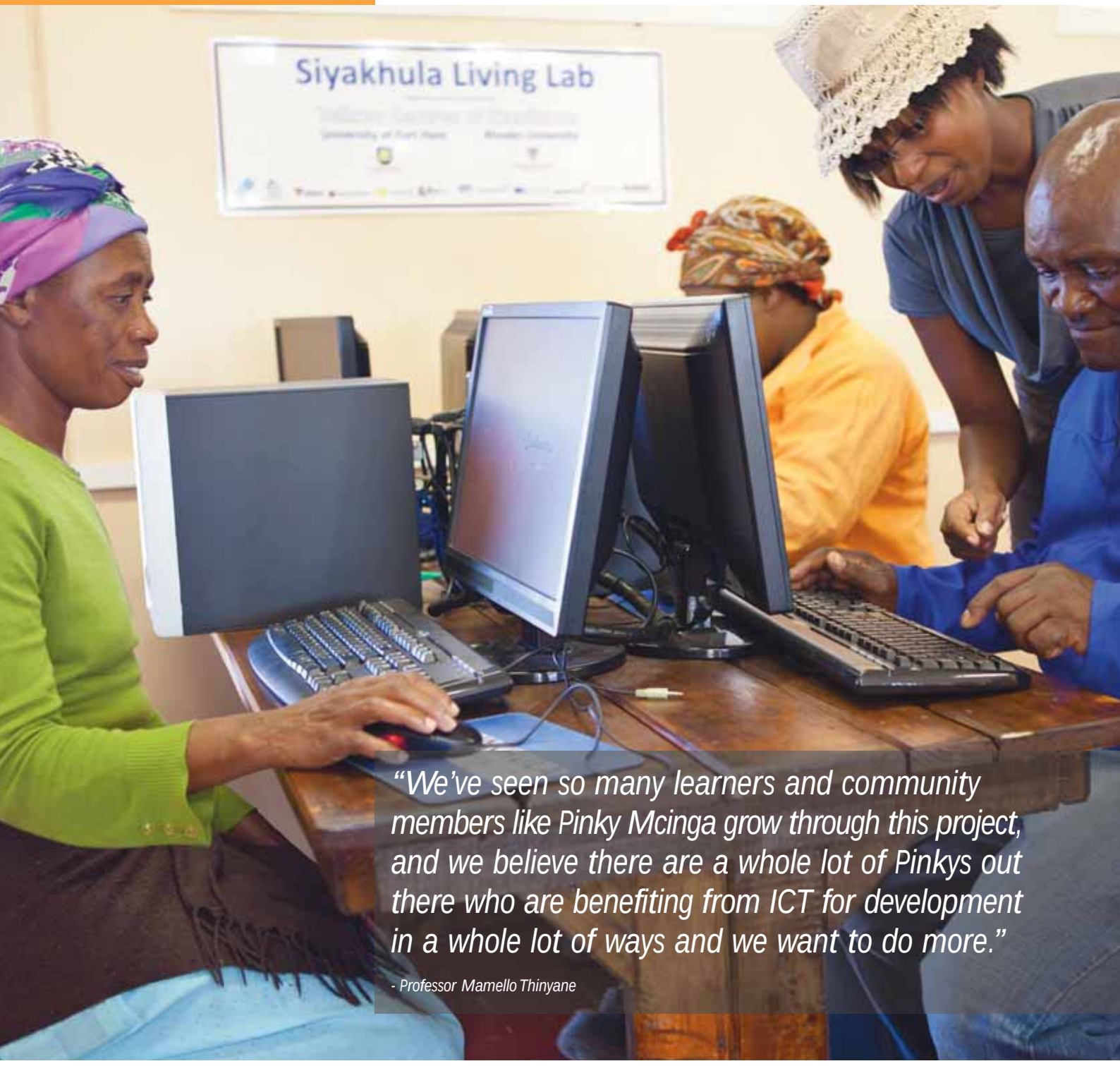
"There is considerable potential for tourism in the area," says Terzoli. The Dwesa-Cwebe Nature Reserve lies, for example, a few kilometers away from the Living Lab. The traditional beading could be another basis for business.

However, the teething problems of the project must be solved first. The Internet connection is disrupted again and again. Very few people have electricity at home, so from time to time someone unplugs the server to charge his cell phone. Dust and heat cause problems for the computers.

Sometimes a school does not recharge the prepaid account for the electricity, so the servers are cut off from power while operations are running. This time the network interface card in Mpume had a quite fatal crash, the hardware burned out because of the electricity fluctuations.

In such cases the team goes out in a day trip to exchange the parts - if the roads are not washed away from the rains and therefore impassable. The way out of the Siyakhula Living Lab into the information age is tough. However, for Sibukele Gumbo this is an incentive, "If our concept works here, it works everywhere."

"Numerous communication barriers have to be overcome in rural communities. Many people in the Dwesa area are illiterate, many only speak isiXhosa. Imagine if the entire Internet was in Chinese - then you get an idea of just how inaccessible the network appears for many people here," explains Professor Alfredo Terzoli.



"We've seen so many learners and community members like Pinky Mcinga grow through this project, and we believe there are a whole lot of Pinkys out there who are benefiting from ICT for development in a whole lot of ways and we want to do more."

- Professor Mamello Thinyane

Key Siyakhula Living Lab Participants

Rhodes University

Prof Alfredo Terzoli

Head of the Telkom Centre of Excellence in Distributed Multimedia, Department of Computer Science.

Ms Ingrid Siebörger

Project Coordinator for the Telkom Centre of Excellence in Distributed Multimedia, PhD candidate, Department of Computer Science: pedagogically suitable and sustainable ICT architectures for previously disadvantaged schools in South Africa.

Prof Lorenzo Dalvit

MTN Chair of Media and Mobile Communication in the School of Journalism and Media Studies. He is also the link to the Department of African Languages for issues of language, localisation of software and training material.

Prof Robin Palmer

Department of Anthropology: social issues and community interaction.

Prof Hannah Thinyane

Department of Computer Science: mobile services and devices.

Dr Caroline Khene

Department of Information Systems: impact and sustainability of the SLL.

Ms Fortunate Gunzo

PhD candidate in ICT Education, Department of Education: digital technologies, digital inclusion and exclusion using ICT.

Dr Mosiuoa Tsietsi

Postdoctoral Researcher, Department of Computer Science: telecommunication core interfaces of TeleWeaver

Ms Mathe Maema

PhD candidate in ICT for Development (ICT4D), Department of Computer Science: indigenous knowledge management and education

University of Fort Hare

Prof Mamello Thinyane

Head of the Telkom Centre of Excellence in ICT for Development, Department of Computer Science.

Prof Alfredo Terzoli

Research Director of the Telkom Centre of Excellence in ICT for Development, Department of Computer Science.

Ms Sibukele Gumbo

Project Leader of the Siyakhula Living Lab Management Unit, Research Assistant in the Telkom Centre of Excellence in ICT4Development and PhD candidate, Department of Computer Science: business and technical models for the development of mobile services in marginalised areas.

Mr Mitchell Kavhai

PhD candidate, Telkom Centre of Excellence in ICT for Development, Department of Communication: e-learning platforms in rural schools.

Mr Sikhumbuzo Ngwenya

PhD candidate in ICT4D, Department of Computer Science: eService applications to enhance Rural Communities Development through ICT4Development.

Mr Nobert Jere

PhD candidate, Department of Computer Science: investigating future-proof eService architectures for ICT4D.

Reed House Systems

Mr Lindikaya Ntshinga

Senior Software Developer.

Mr Michael Appelt

Senior Software Developer.

Mr Okelitse Nyathi

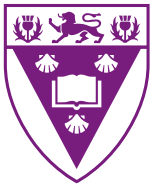
Software Developer.

Mr Ray Musvibe

Software Developer and PhD candidate in ICT4D: middleware architectures for e-services in marginalised areas.

Mr Nkosing'phile Nzotho

Junior Software Developer.



RHODES UNIVERSITY

Where leaders learn

www.ru.ac.za