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REAL-WORLD INNOVATION IN RURAL SOUTH AFRICA

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ABSTRACT

A Living Lab is a new way to deal with community-driven innovation. Living Labs represent, mostly regional – innovation environments focusing on user communities embedded within real-life. In Europe the Living Labs concept seems to be largely accepted as a way to deal with innovation and to get insight into what triggers innovation. Several Living Labs are currently gathered in an European Network of Living Labs aiming to share best practices and lessons learned. However, is this emerging model for innovation also applicable to South African context? The current article explores how best practices and lessons learned can speed up innovation in South African’s rural communities.

Keywords: Living Lab, Community-driven innovation, rural context

1 INTRODUCTION

This article elaborates on the establishment of a Living Lab in a rural environment in and around the Ndlovu Medical Centre (NMC) in Elandsdoorn (Limpopo province) and targets a new beneficiary group. More specific user-needs based methodology will be adopted for product/service development in a rural environment in South Africa. However, what works in Europe, might be different in South Africa. The reason for adopting the Living Lab methodology is that it will overcome many of the problems faced in introducing technology into new environments. For example, the failure of telemedicine projects in Africa characterised by expensive equipment not needs based, locked away, unsuitable for African climatic/cultural conditions, with no training or support. It is believed that through this approach, where the user is at the centre of development, a user-friendly healthcare solution will be developed that is culturally appropriate, robust and sustainable in the African rural context. This section addresses the problem defined through the development and integration of a rural “Living Lab” as a proving ground for inventing, prototyping and marketing new wireless technology solutions. Living Lab is an approach that deals with user driven innovation of products and services that are introduced, tested and validated in real life environments. Important is the focus on user involvement and user experience in all steps of this process with a strong connection between design and understanding of real life behavior (See Schumacher & Niitano (2008) for detailed descriptions on the Living Lab concept).

A Living Lab includes interactive testing, but is managed as an innovation environment well beyond the test bed functions. Given the rural context the Living Lab will provide community based solutions that will be scalable and replicable on the African continent. Users play significant roles by identifying needs and formulating demands, thereby shaping emerging applications through processes of participatory design. To remain effective the Living Lab must encourage and promote close interactions between the developers and users of technology. The Living Lab will encourage public/private/citizen participation as a catalyst for economic growth through entrepreneurship and new ventures in business.

The NMC formula is planned to be institutionalized and replicated elsewhere in South Africa, hopefully by the Department of Health itself within their strategy and budgets for telemedicine. Therefore, this initiative should to be implemented in collaboration with the Department of Health. This has been the case with a previous telemedicine projects in South Africa (Tsilitwa telehealth). There is a strong community participation in the project and the Ndlovu Medical Centre has been involved with the community for 14 years. Dr Tempelman and his team will be key facilitators (Vermeer & Tempelman, 2007). This current initiative is following on the Living Labs research currently being done in the Corelabs (EU IST FP6). In this project Telematica Instituut was heading the harmonization of the methods and tools for Living Labs. Further funders need to be identified for support, e.g. UNDP, IDRC etc. In this joint initiative, the standardization framework of the CoreLabs project is applied in a rural context. Existing Living Labs cases and research provided by the Corelabs project are used

as a reference point to how to design and implement a novel Living Lab, e.g., to define the set-up of a Living Lab in the area of Pretoria, emphasizing the interconnection between rural and urban areas. In this sense, this initiative establishes a bridge between Europe and South Africa allowing (research) insights and ideas are exchanged and validated.

2 UNDERSTANDING THE RURAL CONTEXT

Post-Apartheid South Africa still deals with unequal opportunities, also between urban and rural areas. People living in rural areas face more problems with regard to unemployment, poverty, starvation, illiteracy, high HIV infection/deaths rates, lack of education (opportunities). Communities in the rural areas have very little or no access to public and social services that are necessary for quality of their lives in those areas. Information and communication technology is capable of closing the gap between the rural and urban areas if it is used in a meaningful way for those who need it. In the developing country context, employing human intervention in technology implementation is not uncommon and it shouldn't be. In the rural areas especially, facilitators, brokers, trainers and community leaders play a major role in the acceptance and use of technology. In most cases, individuals who are in these positions have a good linkage with the rural community as well as the urban areas where resources are plentiful; they are literate, communicative, and they understand how the social system operates, and therefore can participate effectively in it. But most important and as the culture dictates, this ‘enlightened’ urban based sector, must somehow continue to take care of their rural families (inherently or inevitably).

2.1 User needs and wishes in rural Africa

In a recent context study rich insights have been gained for understanding the rural community of Elandsdoorn. Instead of talking about innovation and technology we engaged with community members and listened to where they are expert in: their daily lives experiences. In this contextual study expressive techniques such as photos and images were combined with in-depth interviews. The goal of the current approach is to get a deep understanding of the needs, dreams, and drives community residents have. Expressive techniques appeared to helpful in eliciting latent needs and user wishes of rural community members.

Hearing through the voices of the community members, we learned a lot about how the community envisions their future. They indicated that due to disrupted family (deaths, working far away) people are feeling lonely, not informed, opportunities for further (skill) development/education are limited, elderly want to remain in the community, students/parents are motivated to increase their skills, cultural gap between “teaching the business” and people that run a small business. However, it also shows that there is a strong community feeling and that people are willing to try out their entrepreneurial skills.

Therefore, inspired by the rich insights gained in dialogue with the community members the current project aims at establishing an affordable information and communication infrastructure to enable access to information, education, and healthcare but also contributes to social connectedness. In order to start designing for a real world dealing with real-life issues a Living Lab approach will be taken aiming to provide sustainable well-being and communication for all. First steps to reach these goals will be taken by contributing to the improvement of wellbeing of the community as a whole and specific target groups (people, students, patients, entrepreneurs, professionals) in rural areas, offering affordable wireless communication, services and applications offerings that truly contribute to the most demanding/compelling needs of the people in the community, applying a holistic approach, designing and testing the sustainability of the concepts and a model for its replication elsewhere, stimulating local entrepreneurship, and bringing the Living Lab to the people to study impact and social behaviour (changes) of the offerings in context.

3 THE LIVING LAB HARMONIZATION CUBE

The cube for harmonizing Living Labs (Mulder, Velthausz, & Kriens, 2008; Mulder, Fahy, Hribernik, Velthausz, Feurstein, Garcia, et al., 2007) enables the definition of a shared reference of methods and tools used in the European Network of Living Labs (ENoLL) and derives from the assumption that when one focuses on those elements that Living Labs want to exchange with each other, one has an appropriate basis for harmonization of methods and tools. The interoperability cube recognizes these exchange possibilities and explicitly defines interoperability elements from organizational, technical, and contextual points of view in which different standards might apply. It is obvious that not all components of such a standardization framework need necessarily be interoperable. However, some form of standardization is imperative in order to support seamless collaboration in each of these dimensions.

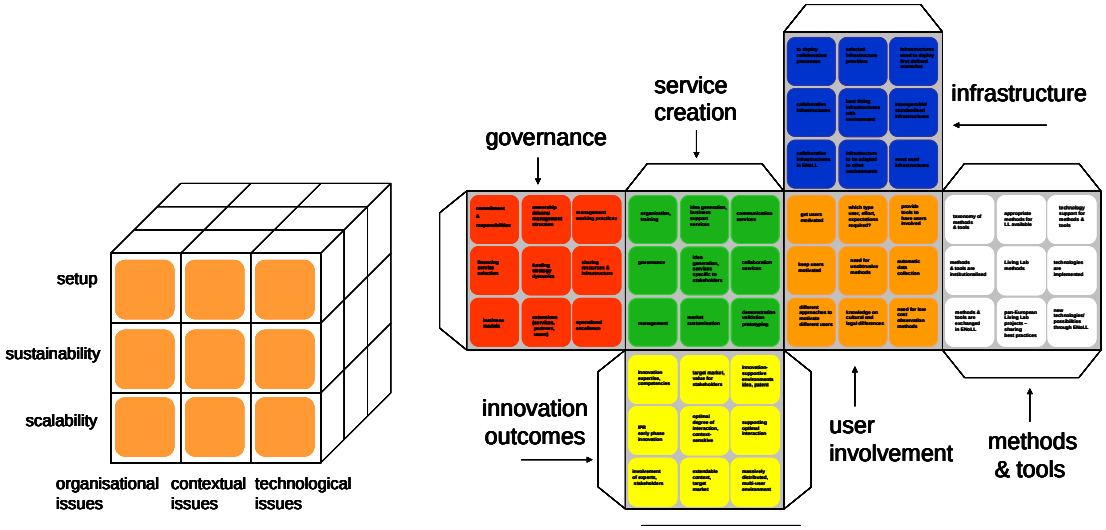

Figure 1: The Living Lab Harmonization Cube.

The interoperability cube for harmonizing Living Labs is a 6x3x3 model (Figure 1). The six sides of the cube correspond with the six most important topics; these are: user involvement, service creation, infrastructure, governance, innovation outcomes, and methods & tools. Each topic (sides of the cube) facilitates interoperability between the phases of a Living Lab (setup – sustainability – scalability). These phases are represented in the cube by the three rows. The three columns of each cube side reflect the organizational, technical, and contextual issues of the Living Lab.

4 UNDERSTANDING THE HARMONIZATION CUBE IN CONTEXT

In order to setup a Living Lab we used the Living Labs harmonization cube for getting the right experiences and right expertise on board. In South Africa, the Living Lab concept is still regarded as a foreign subject practiced far better in Europe. Therefore its methods and tools, however simplified, pose complexities when introduced in South Africa. This is illustrated in the Singazenzela project. Singa involves children as co-creators of a game tool. The game is a metaphor of a place where children can do things for themselves that normally would be harder to achieve in the real world such as have fun, make new friends, store personal documents and get help with finding services for civilians. Singa aims to encourage children to become heroes of their lives. The project contracted a team of social workers to assist in dealing with the children in an appropriate way. The social workers did not have strong IT background, although they were ICT literate. Their role was to observe how children interact with technology in a controlled environment and to note their behavior. The evidence was then fed to developers of games and a game room, a service centre for the children which they've helped to create by giving inputs during the development phase.

Without going into details what can be reported clearly are the strengths and weakness of the process of facilitating user participation and involvement. Facilitating co-creation of product and service or application development is the core service offered by Singazenzela. To begin with, finding children who could participate in the Singazenzela Journey was not a smooth undertaking. Having the SingaLab in Pretoria meant that children within the area could be found, but different culture contexts would not be supported in the reports found from the SingaLab (Moodley, 2007). The story “Shoes of Light” was given to a group of children in the Kwazulu Natal area, where the story is told. They related immediately to the three characters Khanya, Shoe Shongololo and the Lucky Bean. The same story would not relate to the children in Lesotho as the Shoe Shongololo is a millipede and looks much like the centipede that has a nasty bite and being in an area where snakes are feared, it's not a good character to assume as a friend within Singazenzela. The Lucky Bean didn't have much luck in this department either.

4.1 User involvement

As shown in the context study described in section 2.1 there is a strong community feeling in the rural community in focus. The way Dr Tempelman[1] coordinates the development projects illustrates what's key to community-driven innovation in rural Africa. For example the land the medical centre has built on has been donated by the Chief. The Chief, local community and a representative from the centre take part in the decision making of new development projects[2]. As the land for the primary school, pre-school, football grounds and bakery was donated by the Chief; it implies that these facilities are owned by the community, because there are no title deeds available for facilities. Apart from the medical centre itself, quite a number of other community projects were developed by Dr. Tempelman and his team over the last 14 years, employing altogether about 250 people at present, like 4 nutritional centers, especially for babies and small children, a mobile dental consultation room regularly visiting schools, several fresh water facilities, a bakery, a nappy factory, a sports centre, a computer centre and literacy school, a post office facility, a car wash facility and refuse removal service. All these projects were based on explicitly expressed community needs and community consultations, leading to tangible community ownership, and were built and are self-sustainable run by local people, incorporated in the Elandsdoorn Development Trust (EDT), a registered non-profit organization.

The user involvement model of the Ndlovu Medical Centre (NMC) can be seen as a role model for user involvement in rural Africa. NMC was started in 1994 and hosts a multipurpose community development centre. The centre offers healthcare services such as clinic, nutrition program and HIV/AIDS awareness. There are also education services like computer courses and crèche for children. NMC is well known for advancing community cohesion by participating in different projects namely, vegetable garden, old age home and the post office. NMC success is due to a number of enablers. Following the existing community model, the model that is being promoted by the establishment of a Living Lab is one that shows 'quality of life for all through efficient social networks and affordable technological infrastructure'. The way we intend to approach community involvement is through participatory activities whereby community representatives form part of design and implementation of innovations for healthcare and education services. Historically, healthcare and education were delivered in top-down management dominated style. However, South African information society is undergoing radical transformation. For that reason, the end-user focused participatory approach is leading in this multi-stakeholder initiative where solutions reflect the views and needs of targeted users. Due to the dynamic geographic and cultural background evident in South African society, outcomes are typically unpredictable. Involving users 1:1 throughout the process helps to avoid misfit between creative ideas and users' perceived benefit. A major aim of the project is to introduce affordable systems that fit best with the community's

[1] Dr Tempelman as the champion of the medical centre enabled the centre to be mobilized and facilitated the community development projects in the area" (CSIR, 2003).
[2] Before the operation of the medical centre, community structures already existed in this township. The Chief had to be consulted first before any developments were made in the community.

interpretation of improved quality of life in specific domains i.e., family, health, and education. The vision includes having sustainable, community managed, community owned infra-structure that would be accessible, fully understandable, and would make different elements of the community network transparent to one another (Faber, 2003).

4.2 Service creation

Approximately 4 million people in South Africa are disabled and access to information, services and the ability to effectively communicate is a key need. Significant technological challenges exist in making services accessible to people with different forms of disabilities in an affordable way. Existing devices and software that allow people with disabilities to interact with Information and Communication Technology (ICT) systems are prohibitively expensive and have not been designed with South African context in mind. Technical challenges that are being tackled include; research and development in Text-to-Sign-Language, support for South African Languages, development of quality Open Source technologies including Text-To-Speech screen reader and measures to enable Disabled Peoples' Organisations (DPOs) to operate the portal. The Meraka Institute will also explore R&D collaboration with South African Universities and Industry as well as partnering with International peers in Europe and the developing world.

The National Accessibility Portal (NAP) aims to enhance the development and independence of persons with disabilities. This will be achieved through the creation of a highly innovative and efficient information and communication system. The NAP will enable people with different disabilities to access information and services, and to interact and communicate irrespective of age, gender, language and level of literacy. NAP will be a one-stop information, services and communications channel that will support everyone involved in the disability field – persons with disabilities, caregivers, the medical profession, and those offering services in this domain. NAP services will be accessible from anywhere in the country including from home as well as specific and specially equipped service centers and access points located in schools, clinics, hospitals, multi-purpose community centers, etc, linking up where possible with existing government, private sector and Disabled Peoples' Organizations' structures. Usage by unskilled people will be facilitated by interpreters and helpers trained in ICT and disabilities (expected to include people with disabilities themselves).

Digital Doorway is another project illustrating Africa's current practices. The Digital Doorway is a South African-based implementation of the minimally invasive education (MIE) technique. It is designed to provide people in rural and disadvantaged areas with computer equipment, and allow them to experiment and learn without formal training or instruction. This approach has been used by similar projects to address the digital divide and increase mass computer literacy (Mitra, 2000; Slay, Wentworth, & Locke, 2006).

The first Digital Doorway unit was installed in the remote Cwili Village in the old Transkei in South Africa in November 2002. To date the Digital Doorway units can be seen in 169 sites. The program uses six of South Africa's twelve official languages: English, isiZulu, isiXhosa, tshiVenda, Setswana, and Afrikaans. It is based on open source software and accessible to both adults and children. Digital Doorway was designed to be deployed in rural areas which are mostly home for marginalized communities. In general, rural areas "suffer from major infrastructure problems including limited electricity availability and connectivity, minimal telecommunication infrastructure, poor quality of transport infrastructure, and sub-standard education facilities" (Slay et al. 2006: p.115). The communities are typically constrained by economic, social or geographic reasons from accessing ICT facilities and services.

Nevertheless, findings show that the project has exceeded all expectations in improving basic computer skills particularly among younger members of the communities (Gush, Cambridge, & Smit, 2004). The Digital Doorway contribution to ICT for development and MIE has acquired national and international recognition. If possible, it draws attention to ICT issues that need to be addressed from African users' perspective. Some of these are 1) the experiences of adult users as well as children, and the challenge of providing service to these target groups 2) the impact of open source on ICT usage in rural areas 3) challenges around scalability, interoperability, sustainability and reaching vast majority who are separated by distance and digital divide elements and 4) Digital Doorway strategy of alleviating barriers for ICT expansion and usage; essentially as part of the broader poverty eradication drive.

4.3 Infrastructure

Also regarding infrastructure there can be several lessons learned and best practices exchanged; some African experimentation environments are described below. Many African countries are dominated by a single telecommunications provider and this monopoly has had the effect of denying people access to telecommunications particularly in rural areas. This is primarily due to two reasons, high cost of services and the fact that the "last mile" of the telecommunications infrastructure is the most expensive and least desirable for the incumbent Telco to manage and maintain. In order to overcome these challenges, what is needed is a change in mindset, one that suggests a different view of the way infrastructure is rolled out by putting the end user first. Research at the Meraka Institute has shown that such an approach that focuses on the end user can create a bottom up momentum whereby communities are empowered and have a sense of ownership of their own communications infrastructure. Through the use of innovative ICTs and a "just do it" approach communities can create networks that in turn create new demand for ICTs on shoestring budgets. This is the philosophy of the "first mile first inch" (FMFI) project. To that end, FMFI aims to understand and challenge institutional frameworks, regulatory considerations and national policies. The key long-term goal is sustainability: to help local communities build their own neighborhood networks and cultivate the skills required to manage and even replicate the networks in the future.

In light of the limited information and communications technology (ICT) coverage in rural Africa, rollout of WiFi networks provides great potential to stimulate further ICT connectivity. This is due to its relatively low costs, which enables community based, or bottom up, deployment. While at the national level social objectives inform ICT policy and regulation such as universal access strategies, the current regulatory framework in South Africa poses significant challenges to deployment of WiFi community networks.

While mobile telephony for a long time has been thought of as the promising solution to Africa's ICT connectivity problems, innovations in wireless technologies such as WiMax, WiFi and mesh networks, continue to provide new opportunities to enhance ICT connectivity in developing countries, including (rural) under-serviced areas. While mesh networks are still a relatively new technology, in the very early phases of rollout throughout the world, research at the Meraka Institute has shown how deployment of small community based WiFi mesh networks can be successfully deployed. The focus is on the deployment and testing of a community-owned mesh network in a rural context. By using community connection points structured as a mesh network, all the project participants are able to enjoy interconnectivity and access to communications and the Internet either directly or indirectly through applications running on the mesh.

The WiFi mesh network rolled out in Elandsdoorn consists currently of 10 nodes and interconnects the Ndlovu Medical Centre with 4 Nutritional Centres (for telemedicine, education and healthcare purposes), four schools including the OR Tambo school (for e-Education & e-learning purposes), the computer centre (to improve PC literacy) and three small businesses. The Mesh network is connected via a 5.8GHz RCP - Long Range WiFi link to Groblersdal where the connection to the Internet has been realized.

Research by the Meraka Institute showed that a true mesh network with built-in redundancy can be created in a deep rural setting with a number of topographical constraints. It is possible to spread the applications over a range of users, from the clinic to a hospice, to farmers, to the school and individual users. Mesh networks with multi-point links can interconnect different locations up to many kilometers. These expanded WiFi networks provide immense opportunities for community connectivity, through provision of both voice (Voice over Internet Protocol (VoIP)) and Internet access services, a wide variety of applications can be supported for purposes ranging from tele-health and education to commerce.

Some of the lessons learned proved that an effective mesh networks can be introduced in rural settings to provide distributed ICT access. The technical implementation details are also significant. The choice of mesh protocols needs to be considered carefully for each application situation and different options tested before making the final choice. Planned redundancy in a mesh network can be enhanced by unexpected new connections establishing themselves. Testing and adaptation is part of the process to match planning with the reality to achieve a fully scaled mesh configuration. The scaling in mesh networks is not confined to the physical infrastructure, but also showed how the user base can be expanded. The demand

created at the main institutional ICT nodes in the mesh network can be expanded into the community through providing affordable equipment and individual connectivity in the homes of current users. The lessons learned have implications for the scaling and replication of community networks. The intention in Ndlovu is to implement a mesh network, primarily for health and education applications, but with spare capacity to provide connectivity for other applications. The plan is to design an optimum solution for scaling of ICT service delivery incorporating a range of wireless and wired technologies, including satellite, WiFi, fixed lines and GSM options to create a full mesh network with built in redundancy for health, education, and community access.

4.4 Governance

Experience has shown that social change and transformation can best be achieved through effective partnerships involving government, private sector, Non-Governmental Organisations (NGOs), and academia. However, it is crucial to balance the objectives and sometimes conflicting philosophies of these entities. Often community development is more about the process than the end result itself and timeframes do not always align with private sector delivery expectations. However, the private sector has shown positive signs of their willingness to get involved and participate in Corporate Social Investment (CSI) projects with communities. They would do well, however, to align their CSI tested community principles are emphasized in order to achieve development goals.

4.5 Innovation outcomes

The aim of this initiative is to establish an affordable information and communication infrastructure to enable access to information, education, and healthcare and also to contribute to social connectedness. The Ndlovu Medical Centre has a well established communications infrastructure including a leased line for internet access. Just as important, the NMC personnel have established good community relationships empowered local community members and contributed towards local economic development through support for small businesses. The key outcome of this Living Lab initiative is to build on the existing community centre network so that it can extend its reach to the broader community for health, education and community access. This will facilitate communication through internet and voice communications (VoIP) to the outer lying nutrition centers, clinics and schools.

First observations from a baseline study conducted in the Ndlovu area showed that there is a sense of safe and secure environment due to police presence. There were 4 police officers in uniform driving in 2 cars leisurely chatting with people. Youth from the community feel free to utilize the facility. There were groups of young girls and boys playing informally on the netball and basketball courts. The observations illustrate a sense of belonging and community ownership. The cemented water tank had hand prints of people who build it. This

could serve as show-off for number of prevailing social indicators e.g., ownership, pride, skills, and loyalty. Below we illustrate expected innovation outcomes.

Healthcare (HIV prevention, awareness):

The expected outcome for healthcare is to demonstrate how technology can support HIV/Aids awareness and the improvement of lives of those who are HIV+ in rural areas.

Education:

Learners will benefit by accessing electronic information from sources such as wikipedia. Teachers will be able to share lesson plans and collaborate on curricula development. School administration systems can be implemented resulting in greater effectiveness and efficiency in the running of educational facilities.

Entrepreneurship:

Small businesses can access information relevant to their needs, such as government tenders, thereby streamlining business operations and making them more competitive.

Safety:

Safety and security within the community will be enhanced through the deployment of CCTV streaming over the mesh network to a central monitoring station. Such networks can support community policing and provide early warning for police services.

4.6 Methods & tools

There is no standard format for selecting and applying methods and tools for the creation product and services along with users. Although projects may recognize the outcome as “all inclusive” environment where products or services are developed which people regardless of age, gender, disability or race can access and find useful, it is the process of achieving that outcome which projects find difficult. The problem is not so much the lack of methods and tools. Rather it is the strain of trying and testing new and traditional ways that perhaps at face value appear suitable to the context.

The SingaLab illustrates implications for African context. Research was focused on the life of rural children between the ages of 9 and 14. Meraka Institute wanted to know the type of technologies they had been introduced to. What time they have for themselves for playing. What kind of chores they do each day. What they fear the most. What they have to face each day and what their dreams and ambitions are. SingaLab was introduced to urban children aged 9-14 to present the different technologies to the children. How they could be used together and present a very rough sketch of what Singazenzela was to provide to them in the future. An implementation of a basic version of the Singazenzela scope was developed for a network environment including fax machines, mobile phones and paper games. A journey map was designed to guide the children through the different technologies within the

SingaLab. The children were awestruck when they finally understood what they had just achieved i.e., communicating with another group from a cell phone to a computer or vice versa. Or the delivery of a fax to the account created in the SingaLab.

It was concluded during the research with the children and through the SingaLab, that Singazenzela needs to be an interactive game where the children can define the environment that suits them and the friends that will assist them on their journey to empowerment via Singazenzela. Information needs to be maintained and new information needs to be constantly fed to Singazenzela as the children provides indications of things that they need, are looking for and enjoy doing. Steps are now been taken to implement a pilot phase that will include the technologies that were presented to the children. In this phase we are aiming to bring the research obtained in terms of fears, ambitions and dreams. Bringing it together in a system that will allow the children to be themselves in a place they can call home. The aim is to provide as many services as there are individuals and organizations that are willing to assist and join us in our quest. And, what's more, aiming to provide the needs that the children raised as rewards for following a trail of crumbs that is made up of technology and physical objects. Participatory design does not happen without risks. This project will hopefully show the hallmark of establishing successful community branded Living Lab as being early introduction of end-user commitments and ownership of outcomes. Qualitative methods will continue to be used to achieve in-depth insight into process the user needs, user expectations, and user contributions as well as evaluating impact.

5 DISCUSSION AND OUTLOOK

The current divide affects people communicating with others. Not being able to reach other and not being understood makes people feel isolated. It's likely that solutions to solve miscommunications, stimulate interaction, and bridge the perceived distance between people are welcomed by a large and broad audience. The scope of this initiative is very broad because it seeks to create a model for community experiences that shows "value for all". In keeping with the human-to-human interaction design approach (Mulder, 2004) it aims at enhancing the magic (the added value) of community. It is assumed that the distance between people reduces, when people reach a better shared understanding. In the remainder of this work we explore how we can bridge the rural and urban communities.

Having an inventory of best practices available before starting a Living Lab appeared helpful in setting the scene. In order to conduct the user-centred approach the community will be involved from the start. This community buy-in is therefore seen as key to the successful innovation and development projects. Figure 2 illustrates how the Harmonization Cube was helpful in setting the scene and addressing the relevant issues for setting up the Ndlovu Living Lab.

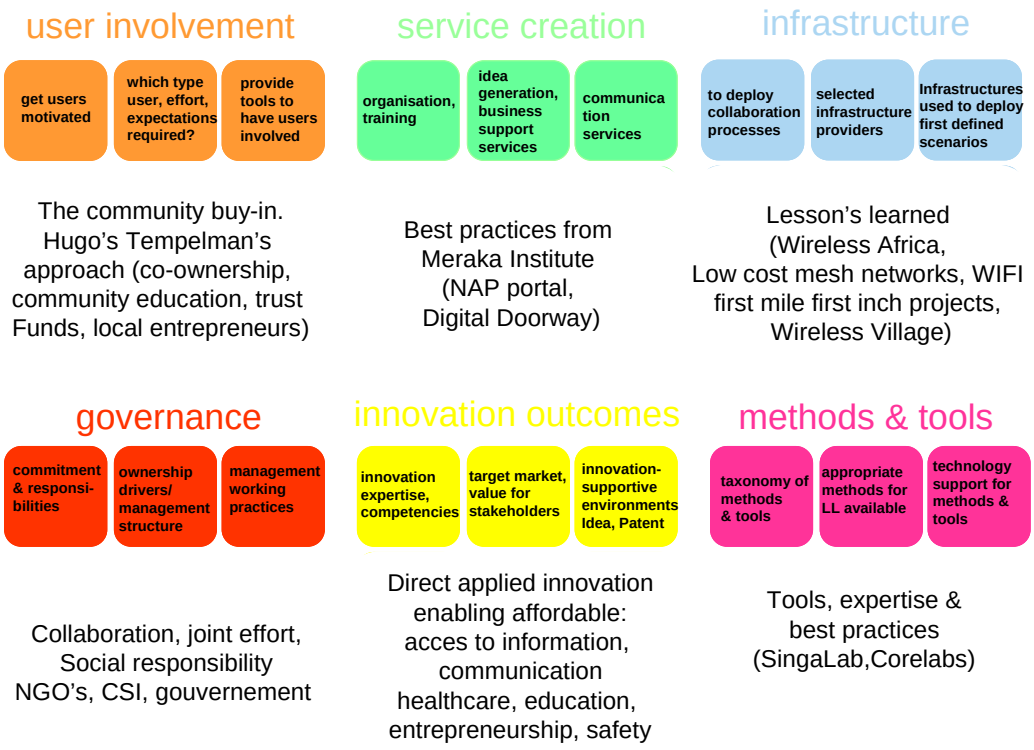

Figure 2: The Harmonization Cube applied in the setting up phase of Ndlovu Living Lab.

In our future activities the challenge is how technology can support HIV/Aids awareness and the improvement of lives of those who are HIV+ in rural areas. There is extensive literature on telemedicine in the developing world and many examples of pilot projects exist in Africa. However, why have these projects failed to be up scaled and replicated? Why computers and expensive telemedicine equipment do remained locked up and abandoned? Why do these projects collapse once donor aid runs out? The Living Lab approach will provide many of the answers to these questions and provide evidence-based research results that influence and shape policy in health and education.

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