

DIGITAL DOORWAY: SOCIAL-TECHNICAL INNOVATION FOR HIGH-NEEDS COMMUNITIES

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ABSTRACT

The application of the Living Lab (LL) approach to social-technical innovation to the Digital Doorway Initiative in the informal settlement of Zandspruit near Johannesburg is outlined in the context of the initiative's evolution from an educational project to a broader community innovation initiative. The relationship between different stakeholders is explored in a theoretical and practical sense as a future research and practice challenge for both the study of ICTs in society (in this case, a poor community), and the fostering of community-driven innovation. The activity also offers a research challenge for understanding the cultural transformations that are necessary for bringing about more effective integration between technical and social-technical viewpoints about design and research in a social context. Current and projected community-based research activities are also outlined, including the development of a project in Australia for high-needs indigenous communities.

Keywords: Social-technical innovation; social-technical design; community-based research and innovation; community informatics; development informatics.

1. INTRODUCTION

“Technologists are often ill-equipped to deal with research that involves people and cannot be expected to be able to have the expertise or experience to deal with it, hence leading to the need to partner with social experts in doing research projects” (Gush, 2008).

This paper focuses on practical challenges for the design, implementation, research, and community ownership of an Information and Communication Technology (ICT) project, centered on the Digital Doorway computer kiosk, in Zandspruit, an informal settlement on the urban fringe of Johannesburg, South Africa. The project is a partnership between community stakeholders, the Meraka Institute of the Council for Scientific and Industrial Research (CSIR), the South African Department of Science and Technology (original funder of the Digital Doorway project), and Monash University South Africa. The paper is also anticipated as the first of a series of inter-disciplinary papers between Meraka, Monash

University and community stakeholders in which a particular, reflective approach to research, implementation and study of social-technical initiatives in a development context will be presented. The paper shows how a broader conception of technology in the community than that originally adopted by the Digital Doorway (DD) designers is being developed.

This change in orientation is in part due to the adoption of a social-political viewpoint which argues that knowledge about community dynamics and structures must be consciously incorporated into community-oriented social-technical interventions. In adopting a community-based research approach, social-technology projects are ethically engaged with interested parties for community problem-solving. This can be best perceived through the incorporation of community-based action research techniques into social-technical projects (Stillman and Stoecker, 2008). In particular, the application of the Living Lab (LL) approach to social-technical innovation (Pitse-Boshomane et al. 2008), to the Digital Doorway Initiative (DDI) in Zandspruit is discussed in the context of the DDI's evolution from an educational project to a broader community development initiative. 'Living Lab' is a concept which refers to a research and development methodology and /approach where innovations are co-created and verified in collaborative, multi-contextual real-world settings. Community members and different stakeholders can be involved in this process of co-creation of new products, services and processes to improve quality of life.

We argue that such joint community-oriented research and action results in evidence to support the proposition that it is not the isolated effect of a technology or artifact (such as the physical 'kiosk') that makes a difference in social-technical projects but rather, its instantiation or enactment (Orlikowski, 2000), embedded in a social-technical web (Lamb and Kling, 2003), or network (Callon, 1991; Law, 1992; Law, 2006). This occurs within the larger framework of a complex and influencing social and political order which influences behaviours, communications, and access to resources in everyday life (Giddens, 1984). Conscious or tacit human agency in this context, influenced in a variety of directions, sets in place conditions for the adoption, appropriation, and modification of ICTs. A key proposition which therefore emerges from this position is that technology structures are emergent, enacted, and dependent upon human agency, rather than being simply embodied through the technology. However, the artifact itself is intrinsically part of this dualistic process since it provides conditions which influence human responses (Orlikowski, 2000). Because almost all research on human-ICT interaction is done in 'laboratory' or relatively socially-privileged conditions, analytically and practically, it is vital to observe and learn from this 'emergence' in community settings in order to maximize community benefits such as the improvement of life chances for the very poor. As part of this process, we are concerned that the agency of the traditionally disempowered (such as those in poverty and without material resources such as personal ICTs) should be brought to the foreground and influence design and implementation, and this is a principle that has come to the fore in the Capability Approach of Amartya Sen and his followers in international development (Sen, 2001; Sen, 2009).

With an understanding that 'technical things have political qualities' (Winner, 1980) in the larger context of particular social-economic formations, DDI can be understood as a purposed social-technical system in which the Digital Doorway is a key technical agent supported through direct engagement with a community for communication, knowledge, and innovation in the context of providing opportunity to a disadvantaged community. The Zandspruit community research project is seen as an opportunity to plan, from the start, for a community-based Living Lab approach to the development of the DD, in which the community stakeholders are effective research partners and integrated with the planning and implementation of technical and social impact studies. Thus, the DD, which is both a community 'intervention' and a research platform for discovery about user and community ICT needs and impacts in a particular context, becomes transformed from a fixed artifact

based on certain ‘engineered’ assumptions into wider a set of emergent practices, skills understandings, technological artifacts and affordances (Gibson, 1977), around the instantiation of a social-technical system. This is the first occasion on which an upfront form of research planning within an identified community has been conducted for the DD, rather than post-fact planning for evaluative research and action.

The research method results in a community-focused approach which acknowledges the multi-disciplinary nature of a collaboration in which artifact or system design is only part of a comprehensive approach to problem solving, innovation, and strong community engagement that can lead to positive impacts (Stillman, 2008). The research partnership is also important because it permits the development of insights into non-traditional areas of Information Systems research and practice, as suggested by Orlikowski, a leading researcher and theorist whose work derives from Giddens, a social theorist who has been influential in social-technical studies (Giddens, 1968; Jones and Karsten, 2008). Orlikowski called for further research into ‘the meanings and emotional attachments that users develop for the technologies they use’ (Orlikowski, 2000: 423), and this is as relevant to the life of people in townships or other marginalized and minority groups (Stillman and Craig, 2006), as it is for corporate studies. The LL process is thus also intended for self-reflection and conceptual theory-building about the relationship between technology and grounded social intervention decisions, benefits, and impact. Research and action in conjunction with communities is also a significant opportunity for original research and activity that supports social justice and an opportunity for previously ‘unheard voices’ (Stoecker and Tryon, 2009) to be heard as part of Monash University’s social justice mission. Such research also supports Meraka’s mandate to support the communities of South Africa through ICT research, development and innovation.

1.1 The South African context

The population of South Africa was close to 50 million at the last estimate in 2009, though many refugees are undocumented (UNDP, 2008). It also has a very large young population with 52% of the population under the age of 25¹. At least 45-50% of the population is considered to be living in real poverty, and at least 7.5 million adults are illiterate. According to the UN Human Development Index (UNDP, 2008), which looks at factors such as life expectancy, income, and school enrolment, all the lowest-ranking countries are African and about 14.5% of South Africa’s population lives on less than US\$2 per day. The poorest households in South Africa are typically those headed by black women in rural areas. Thus privately owned ICTs beyond the widely-used mobile phone are not a proposition, and even in that case, phones are often a shared social device. There are approximately 30,000 schools in the country, perhaps only 20% having more than one computer (Gush et al., 2004).

2. THE DIGITAL DOORWAY INITIATIVE AND KIOSK AS A RESPONSE TO THE DIGITAL DIVIDE

The digital divide between those who have access to skills, knowledge and technological infrastructure and those who do not have access, skills, or knowledge is one of greatest challenges to the uptake of ICTs in the developing world (Loader et al., 2004; Steyn, 2007). While the term digital divide has been replaced in policy discourse by terms such as digital opportunity, or digital/ e-inclusion, the fact remains that whatever the favoured terminology, there is a huge gap between the haves- and have-nots in the opportunity to access and use ICTs. As a ‘developmental state’, a continuing challenge in South Africa is to provide low-cost access, exposure, skills, content, and opportunity for innovation to the poorest of communities, alongside market-based solutions (Terreblanche, 2009).

¹ <http://www.statssa.gov.za/PublicationsHTML/P03022009/html/P03022009.html>.

The DDI, representing a particular approach to the design and implementation of ICTs in poor communities was initiated by Meraka as part of the Government of South Africa's strategic mandate for ICT development, articulated by President Thabo Mbeki in 2002. Mbeki specifically referred to 'technological literacy [being] key to the country's future in an increasingly globalised world', and he called for local solutions to solve the digital divide challenge, with the intent also to lead Africa on the issue. Initially, in response to the challenge of developing a public Internet presence where basic utilities such as electricity cannot be assured, the Meraka Institute developed robust single or multi-user Digital Doorway terminals to provide both cached and direct internet experiences in public locations to underserved, poor populations, based on similar principles of informal learning as demonstrated through the Hole in the Wall project in India, the first well-known public technology project intended to provide informal youth in a slum setting (Mitra et al., 2005). Detailed comparison with the One Laptop per Child (OLPC) project is beyond the scope of this paper but it can be noted that OLPC has been critiqued by others involved in development for its lack of robustness, and assumptions about the individualized adoption of ICTs in developing countries (Kraemer et al., 2009). There are now well over 200 DD installations throughout the country (Gush, 2008), as well as terminals in Ethiopia, Uganda and Lesotho, and a demonstration unit at Monash University in Australia, where there is interest in its adaptation for use by indigenous communities in Australia and the Pacific Islands.

Physically, the core Digital Doorway terminal is a robust physical kiosk with up to four screens, and keyboards with touch-pads, built to withstand the rigors of the African climate, enthusiastic use, as well as physical vandalism. It can be securely bolted to the ground or floor. Terminals are connected to a server running Xubuntu, have connected video cameras, concealed speakers and can be configured for uninterruptible power supplies or solar power. Units can be configured for offline cached accesses or direct internet access via broadband (wireless, cable) or satellite, and remotely administered. A factor in the effective adoption of the terminals has been a local champion who can demonstrate the relevance of the device to children's education. DDs are technically reliable and can be remotely supported with little need for local support other than a reboot or cleaning, but as well, it should be noted that local champions also need to encourage use by the community through active engagement processes: presenting the technology is not sufficient. Not surprisingly, school children have become the prominent users group with DDs in South Africa, including DD installations in non-school areas. While the focus has been upon the production of interfaces in English, materials in South Africa's other official languages can be installed. The standard Open Office suite, cached Wikipedia, and multimedia tools are installed for children to explore and create content.

Additional versions of the DD are being developed, including the lighter and portable 'BEE' in conjunction with UNICEF, targeted at emergency environments (The Communication Initiative Network, 2008). A visually-appealing and ventilated portable classroom or public space version called the Container DD has also been developed. It can be transported by truck and easily erected.

A multi-modal approach to addressing digital divide issues is also advised, in which the DD can also complement various other ICTs in the same community, such as providing Bluetooth access for mobile devices for young people and adults upload and download local information, learning materials, and music and videos that they may make, as part of their learning in the community.

2.1 From Digital Doorway to a Living Lab

However, bridging the divide is not just an issue of hardware and software, content, or showmanship by champions. As is known from the widely acclaimed work of Rogers, technology will only be adopted if it is perceived as relevant and beneficial and having value in such a way that it is adopted, despite any inconvenience it may cause (Rogers, 2003). This experience is known from encounters with ICTs in developing countries (Heeks, 2002) and other studies which speak of the need for 'soft technology' and 'soft infrastructure' to support people's interactions with ICTs (Simpson 2004). The environmental factors which support or inhibit use and adoption or adaptation are therefore of particular interest to future stages of the project.

Because of the apparent success of the DD in engaging children, after eight years in operation, the South African government is now interested in the DD being modified for a wider agenda for social and community developmental or economic impact, and potentially, for commercialization.

The integration of the Living Lab philosophy with the DDI is also seen to provide a platform for the development of commercial applications, services, and processes in townships or other environments where individual computing may not be a cost effective option or mobile devices may not be adequate for conducting all forms of business online.

There is a consequent need to understand how the DDI as a social-technical system can be repurposed to meet differing demands from government and other stakeholders. Meraka has also realized that there is a need to better understand the dynamics between system designers and those engaged in social research and development within Meraka. The cultures of technical designers and socially-oriented researchers are somewhat different and do not always overlap well. More effective exchange between different orientations involved in a social-technical initiative can also be used to design for and discover what is often elusive through traditional laboratory-based or quantitative research means: social impact and particularly community impact. Combine this with the mutual desire to engage users on the ground as engaged community collaborators, and the research-design-implement-evaluate equation becomes culturally and practically quite complex.

3. THE ZANDSPRUIT COMMUNITY AND ITS NEEDS

Zandspruit has a population of approximately 17,000 families (50-60,000 people) in an area of about 3km², on the north-western edge of the metropolis of Johannesburg. It is bordered on all sides by a number of affluent communities which includes the Monash University South Africa campus. In addition, the mixed ethnic nature of the township with its different languages and cultures, as well as the disembedding of family relationships because of migration, means that the community structure is quite fluid and complex, and social support needs are high in a poor community. Such factors cannot be ignored in social or technical research or intervention.

As in other townships, basic infrastructure is lacking in Zandspruit. Townships, situated close to major communication routes, grow so rapidly that they often have poor or no electricity supply, sewerage, water, roads and other urban services, including schools, health facilities and so on. The digital divide is also starkly highlighted with poor communities that live in close proximity to wealth and technological opportunities in modern South Africa.

However, despite the lack of amenities, townships are vibrant living communities and not just stigmatized 'slums' that lack social, cultural or economic capital with positive attributes that can be built upon rather than being bulldozed (Huchzermeyer, 2009)². For example, the Alexandra township situated across the road from the affluent suburb of

² <http://www.prospectmagazine.co.uk/2010/01/how-slums-can-save-the-planet/>

Sandton in Johannesburg is now 104 years old, and is a thriving multi-generational family settlement. Zandspruit is only about 12 years old, but is showing signs of becoming a permanent township.

Monash University South Africa has a program of long-term social engagement with NGOs, including student and staff support of the community in a Saturday School and other activities in partnership with NGOs based at the Emthonjeni Community Centre at Zandspruit. The installation of a DD kiosk in early 2010 is viewed as an important step in developing infrastructural support at Zandspruit and providing opportunities for all the community to have a computer experience beyond formal lessons or technological access in a laboratory environment. Monash has been careful and respectful in the development of its relationship with Zandspruit, given that it is a prosperous foreign institution in the eyes of most South Africans and respect is essential in any relationship between such unequal partners³.

But it must be asked, why is the DD relevant to such communities when other priorities such as water, sewerage, electricity or basic housing are needed? A key reason is that English is the major language of the formal economy in South Africa. English and computers provide employment opportunities, whether in the local settlement's economy or for employment in the bigger city. Many of those living in settlements who are employed now use some form of technology that requires an understanding or use of English, whether it is an electronic order PDA or cash register as a waiter, or using software and emails in a clerical position. We additionally suggest, based on anecdotal evidence, that there is a strong aspiration amongst parents and carers in townships for their children to have ICT skills. Thus, schools need robust ICTs to educate children to the same level as other more fortunate South African youth so that they too have equivalent employment opportunities in the future. Furthermore, mother language tuition in the primary schools is also under pressure. The learners and teachers consequently need exposure and access to educational resources in languages other than English.

For the large unemployed population technological proficiency is therefore a prerequisite for skilled employment of all sorts, whether in a supermarket, restaurant, or an office. Of course, there is a pervasive use of mobile phones in many poor communities (UNDP, 2008), but access to mobile phones is only part of the answer for effective integration into the world of ICT interaction.

4. A LIVING LAB APPROACH TO COMMUNITY-FOCUSED ICT DEVELOPMENT

As already suggested, the Living Lab refers to a research and development methodology where innovations are created and verified in collaborative, multi-contextual real-world settings (Eriksson et al., 2005). However, the thrust of ICT-focused Living Labs has been upon technology-driven product development (for example, cell phones), for commercial purposes rather than tools that are conceived of as part of a broader social development or social change agenda. Thus, a more conventional definition of the Living Lab has been to support 'functional regions' where stakeholders have formed a Public Private Partnership (PPP) of firms, public agencies, universities, institutes and people, all collaborating for creation, prototyping, validating and testing of new services, products and systems in real life contexts (Wills et al., 2009).

The Living Labs approach to the DDI has adopted a broader social-political viewpoint where the LL takes a role influencing and assisting collaboration between different community-oriented stakeholders using technology for community building and community problem-solving (Pitse-Boshomane et al., 2008). The methodology equally draws upon, and

³<http://www.theage.com.au/national/education/an-african-venture-20091113-ie67.html>. <http://emthonjeni.com>.

aims to harmonize the diversity of social and technical knowledge, whether tacit or practical, that contributes to people's agency in society (a sociological point emphasized by Giddens, 1984). A particular concern is to engage users and stakeholders from deprived communities, working with the complexity of grass-roots community dynamics, politics, and power structures in the community engagement and development process, a factor long-recognized in community development literature and practice. However, this is only recently acknowledged in Information Systems thinking (Byrne and Sahay, 2006), which is more attuned to conventional organizational and management thinking rather than well-known axioms in community development (Rothman, 1972).

When considering the issue of social change, Suchman's comments about the 'situatedness' of technology is critical to effective design and use in a variety of social settings (Suchman, 1997; Suchman, 1999). However, this principle has not been well-articulated, if at all, with respect to disadvantaged situations such as those found in South African townships. A most difficult challenge in all of this is to work with communities to find socio-technical solutions to the proposition that people are not merely stakeholders in their heritage or particular communal identity, but that they 'own that heritage and the right to fully control if and how research is undertaken on that heritage' (Niven and Russell, 2005: 236). In particular, the issue of intellectual property rights regarding co-creation of innovations within communities should be addressed in any project.

This interpretation of the Living Labs approach can be associated with insights in Community Informatics and Development Informatics with which it has considerable conceptual overlap (Heeks, 2006). Gurstein, who is widely cited in Community Informatics, recently suggested that Community Informatics involves: "... a commitment to universality of technology-enabled opportunity including to the disadvantaged; a recognition that the 'lived physical community' is at the very center of individual and family well-being - economic, political, and cultural; a belief that this can be enhanced through the judicious use of ICT; a sophisticated user-focused understanding of Information Technology; and applied social leadership, entrepreneurship and creativity" (Gurstein, 2007).

That is, Community Informatics is a type of social-technology theorization and practice that promotes social change and human development in conjunction with technology. Community Informatics is thus a specific form of research and implementation at a micro-level of society, directed at local communities and even smaller collectivities in them (community organizations, families, informal groups, village micro-enterprises. Its theories and practice are based on fields as diverse as information systems, management systems, library sciences, program evaluation, and community development, and these bring a particular nuance to working with communities on the ground whether in Western or developing countries.

Furthermore, without effective consultation and community acceptance, all sorts of projects and interventions flounder, and ICT projects are no exception to this experience (Stoecker, 2005a). The diversity and social circumstances of communities present a great challenge to assumptions about linear project implementation or simplistic forms of evaluation, because working with on-the-ground issues in collaboration with communities takes forbearance, patience, flexibility, time, and especially humility. However, because ICT policy and practice for needy communities is often driven by political imperatives that can be risk averse and time-driven, finding a solution that bridges community, and other funding and political interests, is an enormous challenge.

Another point that is strongly held in Community Informatics is that the overall history of action and research (even of the most well-intentioned sort) with disempowered, marginalized and other communities has all too frequently been bound up with the effects of colonization, unequal benefits of research, and deterministic cultural, political, and economic

agendas in favour of the researcher, rather than the ‘researched’ (Bishop, 2005). The same comment is relevant to socio-technical research, however well-intentioned, where the concept of the ‘individual’ and ‘community’ has lacked multi-disciplinary depth and nuance (Stillman and Linger, 2009). We therefore aim to explore ways of solving the problem of working across the ontological and epistemological boundaries that exist between IS designers and those focused on broader social processes in which technology plays a significant part, because it influences the innovation process, whether in the social or technological domains that can be outlined for different IS processes (Hirschheim et al., 1996).

Additionally, within the field of Development Informatics, there is an approach that is critical of the appropriate use of Western ICTs and systems which benefit no-one but elites and in fact, only serve to highlight the potential for well-intentioned projects to serve to disempower local interests (Avgerou and Walsham, 2000; Zheng and Heeks, 2008) and reinforce relations of dependence on external players. This is a viewpoint that has emerged from dependency theory which has developed in a variety of different (and debated theoretical forms) as described by Sonntag (Sonntag, 2001). Consequently, socio-technology interventions should empower and provide dignity to those in need. At their worst, interventions psychologically alienate and disempower, a point well known from the writings of Franz Fanon on colonization in Africa (Fanon, 1967; Gibson, 1987). Equally, the question of empowerment was the major theme of the November 2009 Prato Community Informatics Conference.

However, in the desire to compensate for this inequity, it is naïve to assume that it is always possible to work ‘from the bottom up’, and that ‘participation’ means everyone needs to take part. Nor can ‘community’ be considered as a unitary form of social structure. An important insight from community based research methodologies concerns the technique of ‘working from the middle’ (Stoecker, 2005b: 47ff). Thus, more often than not, a project works with respected key stakeholders or intermediaries (Madon and Sahay, 2002), such as community workers, who act as middle-of-the way brokers between researchers and research participants. Having a trusted relationship with such stakeholders is important, because their leadership within a community (contested as it may be), and in leading researchers, is critical to developing more authentic and confident participation in contexts such as that found in Development Informatics projects (Bailur, 2008a; Bailur, 2008b). Therefore, being familiar with community based research techniques such as ‘working from the middle’ is important for effective LL practice.

Ultimately, to adapt what has been suggested by the Aspen Institute in its overview of the necessity of open and multi-disciplinary comprehensive studies of community change (Kubisch, 1997), the ‘recipes, ideas and techniques’ discussed here can create a culture of ‘systemic connection’. Understandings between developers, researchers and community stakeholders can be deepened and strengthened through negotiated understandings and translations into mutually understood ways of different rationales and expectations for the development and implementation initiative social-technical initiative. This way of working is also supported by the LL methodology.

But such new connections and recipes are not intuitive or easy to acquire, and need to be consciously ‘worked at’ as reflexively-considered ‘systems of accumulated expertise’ over time, because of their differences with more conventional socio-technical activity (Giddens, 1992). New, community-oriented skills need to be acquired, such as those involved with identifying reliable and respected stakeholders from the community. This remains the ongoing challenge to working with communities such as those found in Zandspruit and of course, the communities themselves should be both encouraged and supported to develop their own ability to work with professionals in organizations like Meraka and Monash.

5. PRIOR, CURRENT AND PLANNED ACTIVITY

5.1 Prior Activity, 2008-2009

A review of the principles of Community Informatics and program evaluation techniques was conducted by the first author in conjunction with Meraka and Monash South Africa (MSA) staff on two occasions in 2008 (Stillman, 2008). Principles behind community-based research (including different forms of evaluation) and community development were also discussed as a way of providing concepts and a vocabulary to describe and outline different community and stakeholder interests.

Through this intensive process Meraka and a few MSA academic staff were able to acquaint themselves with each other's interests and develop a common framework about working with communities. Additionally, new and significant ideas were generated. For example, in the first workshop series, the metaphor of an 'ideal type' was introduced, drawing upon Max Weber's foundational work in sociology (Weber et al. 1977, 90). The principle of the ideal type was used to develop a representation of the DD ideal for modeling and discussion. This struck a strong chord with people, and one of the participants came up with a statement which still carries some weight because it encapsulates much of what is intended about the DD: 'Digital Doorways being built by each community and maintained by the community, that are sustainable and contributing to the development of that community'. This statement brought to the fore the insight that the Digital Doorway device was something more than a device, but a social-technical change agent and that it was positioned within a social process - the Digital Doorway Initiative (DDI).

5.1.1 April 2009

An additional set of workshops held in April 2009 reflected upon the DDI as a group (rather than individual) socio-technology that could serve different purposes. An Australian Indigenous elder, Ian Trust, from the Wunan Foundation in Western Australia took part in the workshops and participated in field trips. Some of the key factors that were articulated included:

- an emphasis on group rather than individual use (as opposed to commercial devices which focus on the individual user). Group social interaction by a group is critical for informal learning as distinct from the more individualized approach that underlies the One Laptop per Child, for example.
- a goal of support infrastructure being aimed at bottom-up adoption and innovation rather than off-the-shelf commercial technology which stops at the consumer, or depends on a further commercial relationship. Thus, the DD is a 'sponsored' social computer for multiple users, rather than a self-funded or corporate personal computer.
- the fact that the DD is an 'embedded social technology' in deliberately designed or intended circumstances concerning social, economic, educational, and community development.
- the fact that the DD may be a first stepping stone for many people into more portable and personalized/configurable technologies and that it is a place and platform for peer-assisted learning/informal learning.
- the idea that the DD is a communication hub for uploading and downloading information.
- the idea that the DD as a social hub and focal point for the community.
- the issue that the DD is designed for circumstances where technical support is limited and a strong, robust device is needed that can be easily supported locally or remotely.
- the fact that the DD is meant to be a technical platform and environment for social-technical research.

5.1.2 October 2009

In October 2009 a workshop between Zandspruit stakeholders, Monash and Meraka resulted in a values and mission statement being developed. A number of community project ideas were outlined. A second Australian Indigenous elder, Henry Atkinson, Yorta Yorta elder in Victoria/New South Wales took part in these workshops as well and also visited DDI sites as well as Zandspruit.

During the workshop a number of scenarios were developed on which to base possible future collaboration within Zandspruit around the DDI. The group was mindful of the need to carefully balance academic expectations of a community as a 'research subject' and the desire of students for social engagement and academic publications, with the stronger ethical concern about the rights of a poor community to protect itself from colonization by a prosperous international institution. The mission and values statements were as follows:

- Community-based Research (CBR) for Zandspruit is a collaborative co-creative journey between scholars (researchers, technologists, community members) and the people they serve.
- CBR for Zandspruit validates multiple sources of knowledge and promotes the use of multiple methods of discovery and implementation and of dissemination of the knowledge produced.
- CBR for Zandspruit has as its goal social action and social change for the purpose of achieving social justice and improving the human condition.

It was strongly felt that the process of community engagement, and not just research was a 'collaborative co-creative journey' in which there was a lot to be learned, whether on the part of high level academics and administrators or members from the community. The third statement is also significant because it offers an overarching vision in which to place social-technical change activity.

An even higher ranking mission statement was also developed between Meraka and Monash, which in the opinion of one participant, could become a statement in which to frame many other projects undertaken by Monash in the social justice area. If such a statement is adopted, it would be a significant achievement for Monash. The statement outlined the following principles:

- Monash and Meraka wish to work towards a joint impact for transformation in a partnership with the Zandspruit community.
- For Monash and Meraka the challenge is empowerment of the Zandspruit community in the context of a long-term trusting sustainable relationship.
- Monash and Meraka wish to establish a framework which can be adopted elsewhere to inform other community processes.

One participant strongly suggested that a way of ensuring community support would be for it to be endorsed by the local African National Congress local government councilor, a strong advocate for the community. A meeting was held with the councilor after the workshop and she expressed her support for the proposed partnership on the DDI. While this may seem a limited step, at something removed from a 'community vote', this is a significant step forward in South African political terms. Four scenarios for potential projects were also outlined. These can be summarized as follows:

1. PhD research by Sheelagh Walton: does the DD enhance informal learning as compared to tutor-based computer literacy knowledge?
2. Kids as Designers: kids could implement and investigate a bottom-up design approach to any project they need information on, such as designing their own games for maths or typing skills.
3. Skills development in entrepreneurship with ICTs tools for small or micro-businesses in partnership with the Monash students' organization SIFE.
4. An NGO capacity building project: to develop ICT innovation with NGOs based in Zandspruit around social media for the community.

5.1.3 February 2010

In February 2010 the DD was installed and launched at Zandspruit. It is available for everyone in the community to openly use and experiment on.

5.1.4 May 2010

In May 2010, a joint Meraka-Monash workshop focused upon the connection between the Living Lab approach and Community Informatics and the DD technical development trajectory. A research agenda is now proposed around the main research question: What is an effective LL innovation method through which the DD can evolve as a social-technical intervention? The associated questions are:

- What guides the innovation process of the DD?
- What is the response of the different players in the communities to the DD as a social-technical intervention?
- How can LL methodology be applied to facilitate different user driven innovations?
- How does socio-technical design influence the usefulness of the DD?
- How can customization of the DD add value to the stakeholders in different communities?
- How to effectively engage LL techniques as a research tool to address the questions?
- How can community members most effectively inform other stakeholders?
- What is an effective self-reflection process for the LL stakeholders?
- What are effective community-based impact evaluation means and measures for social-technical systems?

The transition from technical design with its inbuilt specifications based upon traditional user-requirements analysis, to a richer form of interactive social design by non-typical users with researchers and designers is a major transition point for Meraka. Meraka's desire to change reflects a move away from the underdevelopment of 'social factors' within Information Systems and Soft Systems (Walsham, 1995; Lamb and Kling, 2003) from a systems approach, and a desire for positive experiences in meeting complex social reality for designers from the perspective of ethnographers or those with other insights (Salvador and Sherry, 2004).

Social use in complex settings cannot be predicted in the laboratory. There must be effective social embedding for full social-technical interaction and the observation and feedback of effects, experimentation, and recording of unanticipated. Understanding and incorporating the unexpected is a long-standing problem in social theory (Merton 1936), but is necessary task for effective social-technical design.

Table 1 (Adapted from Stillman and Linger, 2009)

Standard (Tool) Perspectives for IS	Social Informatics Perspectives	Community Informatics Perspectives	Living Lab Community Innovation Perspective Applied to Townships
IT is primarily an individual tool	IT is a socio-technical network	Community networks are social technical relationships and structures for local communities; both people ICTs have degrees of agency.	Observing and assisting with the innovative use of the ICT artifact in a real life community
Traditional business model is sufficient	Ecological view is needed	A community model is needed that incorporates depth understanding of community and community organizations as supporting group social solidarity and human agency.	Facilitating negotiation between business and community over ownership of IP created. Living Lab acts as an incubator for community innovation.
One shot implementation	Implementation is an ongoing social process	Ibid., and is ideally a community-oriented participatory process.	Co-creation of innovation by all stakeholders (community, social & technical specialists, entrepreneurs)
Technological effects are direct and immediate	Technological effects are indirect and involve different time scales	Ibid.	Ibid, but research is directed towards finding means to demonstrating economic and social impacts and outcomes.
Politics are bad or irrelevant	Politics are central and even enabling	Community politics are as complex as any other politics. Social justice is critical.	In order to achieve institutional collaboration, institutional politics need to be managed (community, business, academic, funders)
Incentives to change are unproblematic	Incentives may require restructuring (and may be in conflict with other organizational actions)	Incentives are in the social domain: ‘what’s in it for us’.	A complex mix of stakeholder incentives. Striving for alliances and alignment between stakeholders.

Relationships are easily reformed	Relationships are complex, negotiated & multivalent	Power, language, power, gender, class, disability, ethnicity need to be accounted for.	Also complex and dynamic where culture, social structure, and technology concepts play a role. There are different power relationships.
Social impacts of ICT are large but isolated and benign.	Potentially enormous social impacts of ICT	Ibid, and potentially enormous social and community repercussions of ICT	The same, but one of LL's aims to demonstrate impacts and usage for different stakeholders
Contexts are simple (a few key terms or demographics)	Contexts are complex	The vocabulary and agency of community and community organizations need to be well understood. Gender, class, disability, ethnicity need to be accounted for	Contexts are complex and different based on specific community requirements and needs. The composition of key stakeholders differs in each context.
Knowledge and Expertise are easily made explicit	Knowledge and Expertise are inherently tacit/implicit	Ibid. ICTs are not at the core of many community/community agencies actions. Social/people technology is just as important.	There is a complex relationship between IS or artifact designers, and social researchers, and communities in explicating knowledge and expertise; developing a shared language is difficult
ICT infrastructures are fully supportive.	Additional skill and work are needed to make ICT work	ICTs are an additional layer to human-technology networks and may encounter resistance.	Test and evolve ICT infrastructures: 'the jury is out'. A key question is: does this work for the community or not? If so, why?

Related to this desire was a discussion during the workshop concerning the need for a cross-paradigmatic language between the technical and social researchers to deal with issues such as technical product development needs, the different natures of technical and social feedback, and as a means for jointly articulating the social impact of technology across technical and social domains of expertise. From the examination of different perspectives and techniques and real, symbolic or perceived boundaries (Lamont and Molnar, 2002), that exist or occur between technical, social and community interests better design, implementation, and evaluative actions can be undertaken.

As a result of this research activity, the table below, based upon earlier work in comparing the dimensions of Information Systems, Social Informatics and Community Informatics, has an added column outlining the perspective of the Living Labs approach and this will be developed in future research.

This work will be used to align ongoing work by Stillman, Linger, and others at Monash to unpack the conundrum of Information Systems and Community Informatics: that the 'social' and 'technical', because of their fundamentally different world views and orientations are exceptionally difficult to integrate in design, use, and evaluative methodologies (Stillman and Linger, 2009). A comparison of different approaches to the social and technical, incorporating the Living Labs perspective was also briefly outlined for future exploration. From the examination of different perspectives and techniques, real, symbolic or perceived boundaries for conceptual or practical demarcation (Lamont and Molnar, 2002) that exist or can occur between technical, social and community interests-are highlighted as issues for careful reflection and research during the next project stage at Zandspruit.

6. CURRENT RESEARCH

First, a baseline research project was completed successfully and the findings were reported on at both the CIRN2010 conference in Prato in October and at the IDIA2010 conference in Cape Town in November. These two papers presented the initial study of reactions to the DD in Zandspruit by key community stakeholders since its installation in February 2010. Second, a PhD study undertaken by Sheelagh Walton, which assessed the impact that an ICT training program, held on the Monash University South Africa campus, undertaken by the severely impoverished Zandspruit learners, had on the engagement of the learners with the DD. The exploratory study tested the hypothesis that a community will be more technologically empowered, when the small group of learners, acting as change-agents within their own community, informally share their ICT knowledge with members in their community.

Walton's study describes how this unique combined set of circumstances did not produce the expected results. For example, there was no sharing of ICT knowledge by the learners with their community, there was no far-reaching technologically-rich 'ripple effects' through the community. The PhD study set out to demonstrate how a minimally-invasive learning environment, that which is being supplied by the DD, can be nurtured, promoting self-exploration and encouraging technological-usage, understanding and enjoyment by an indigent community when the children are used as catalysts and evangelists in this environment. However this was not the case. The findings from this study are being recorded in fulfillment of her PhD degree, and will be shared at the CIRN2011 conference in November 2011 by Walton.

An evaluation of the Digital Doorway project was commissioned by the project sponsor, the South African Department of Science and Technology. The evaluation started in April 2011 and ends in March 2012. The evaluation combines Outcome Mapping (Earl, Carden and Smutylo, 2001) with its focus on outcomes as behavioural change and narrative enquiry. A cutting-edge software tool, SenseMaker®, will be employed to act as a narrative

database and analytical tool for monitoring the social patterns associated with the Digital Doorways. SenseMaker®, was originally developed by Cognitive Edge (www.cognitive-edge.com) in the context of risk assessment, early warning, horizon-scanning and anti-terrorism for the Singapore Government. SenseMaker® was designed to bridge the gap between qualitative and quantitative research and assessment methods by combining the richness of narrative (qualitative) with the scalability of numbers (quantitative). SenseMaker® achieves this first by gathering narrative material (qualitative), then secondly asking those contributing the narrative to signify (index) their stories using a set of questions that form an interpretative framework for assessment. The self-signification assigns meta-data to each story in the form of quantitative values that then allows the stories to be compared, assessed and interrogated for patterns. The results from these two methodologies will be combined and analysed. Furthermore, a research grant to conduct work through Monash South Africa will also allow the participation of Monash staff in the research investigation.

In the Australian context, approaches have been made to the federal government in conjunction with Australian Indigenous partners for supporting the implementation of the DD concept and its development for Australian conditions. Due to the particular conditions of Australian Indigenous people, proposals have been framed in the context of the development of improved social and economic outcomes for communities. There are fundamental change goals contained the federal 'Closing the Gap' policy⁴, and improved communication capacity is one particular strategy to achieve them.

There are a number of formidable challenges to such a project, subject to the conditions that are familiar with many other projects and programs involving remote communities in Australia. Because of the social justice orientation of the government towards indigenous communities, it is necessary overcome barriers to opportunity. What may seem simple and obvious in other situations cannot be assumed for remote Australia particularly when the need for local consultation and with local cultural practices and languages is absolutely critical. Communities are also strongly concerned to prevent the intrusion of pornography into the communities via the internet because of its link to sexual abuse and violence, and filtering needs to be conducted subject to community agreement. Other factors include physical isolation, and the high cost of maintenance for any activity, whether it is something like a school, health service or telecommunications in particular. For several months of the year, due to the extreme weather conditions, road travel is severely limited, and flight costs are high. The extreme humidity will also be a technical challenge.

From a research perspective, it will also be a logistical challenge to work with a community several thousand kilometers away from Melbourne to develop a collaborative research and development program, and even Darwin, the capital of the Northern Territory is many hours away by road (if accessible) from some of the possible sites. Furthermore, the research program will demand an approach that is highly sensitized towards the particular condition of Australian indigenous communities.

7. CONCLUSIONS

Research on the evolvement of the DDI in the Zandspruit community allows for the interaction between different role players and stakeholders which include academics, social and technical researchers, NGOs, Monash University, Meraka Institute and most importantly, the Zandspruit community. The application of the LL methodology, particularly sensitized by understandings drawn from Community Informatics, and Community-based research is seen as a vehicle to support the development and empowerment of all the role players involved,

⁴ http://www.facs.gov.au/sa/indigenous/pubs/general/Documents/closing_the_gap/default.htm. See also on Altman, "Closing the gap between rhetoric and reality", <http://www.abc.net.au/unleashed/34484.html>

enhanced by a better understanding of the social-political context of research and action. Community-based needs and input is highly recognized and encouraged. The potential of future papers, ideas generation and activity is indicated for South Africa and Australia, where the particular needs of Indigenous communities must be incorporated into any project on the ground. Different research perspectives and issues have been outlined and this allows for a fertile ground for action and research where the DDI is a social-technical change agent set in action through human activity in different high-needs contexts.

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