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Felix F. Ntawanga MR
SAP Research, Pretroria, fntawanga@gmail.com

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Ernest Ketcha Ngassam
Faculty of ICT
Tshwane University of Technology, South Africa
SAP Next Business and Technology
ernest.ngassam@sap.com

Felix Ntawanga
SAP Next Business and Technology
South Africa
felix.ntawanga@sap.com

JHP Eloff
Department of Computer Science
University of Pretoria, South Africa.
SAP Next Business and Technology
jan.eloff@sap.com

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ABSTRACT

The need to introduce technologies in rural areas so as to capacitate communities towards overcoming various socio-economic challenges remains a priority in emerging economies. We rely on the foregoing for the investigation in the Kgautswane community in South Africa, of a range of socio-economic challenges that can be addressed through ICT. Identified challenges are further filtered for the selection of an appropriate intervention based on previous experience in the community. The appropriate challenge forms the basis for the development and deployment of an eProcurement ICT solution for small scale traders in the community with emphasis on the concept of a sociopreneur (socio-economic service provider) for leveraging the socio-economic impact of the solution deployed. The overall process is relied upon to develop a roadmap for ICT solution deployment in rural areas that can serve as a blueprint for undertaking similar interventions in the framework of ICT for development.

Keywords

Roadmap, ICT4D, socio-economic development, eProcurement.

INTRODUCTION

Information Communication Technologies (ICT) are increasingly being regarded as one of the key drivers to socio-economic development in emerging economies. For the past few years, the impact of

ICT has significantly improved the lifestyles and living conditions of people in rural communities (UNESC, 2009; Jeremy, Beghin and Pickens, 2010; Gumede, Plauche and Sharma, 2008). This improvement is mostly due to the high penetration and adoption rate, and usage of various forms of technologies such as mobile devices by rural communities for accessing a range of services. Recent studies shows that ICT initiatives implemented in rural areas can give an opportunity for rural environments to develop themselves and grow towards communities that can be benchmarked and even compete with other urban areas. Examples of ICT socio-economic topics that have been widely explored include health, small business, agriculture, education and governance (UNESC, 2009).

Mobility and Internet connectivity are two influential enabling technologies that are ordinarily being used as deployment platforms for various socio-economic interventions in rural communities. High penetration and usage of mobile phones has provided a conducive environment for implementation of ICT initiatives in rural communities (Jeremy, et al., 2010). In addition, most rural areas in emerging economies, such as South Africa, have mobile data communication systems that provide rural communities with smooth connectivity to the global world. Several ICT initiatives that build upon the existing infrastructure such as network connectivity and high usage of mobile phones in rural areas have been deployed in a number of developing regions. However, very few have succeeded and many fail because of factors such as technology feasibility, acceptance and sustainability (Etta and Wahamahiu, 2003).

Various methodologies have been put in place as remedies for such challenges during implementation and deployment of ICT solutions in rural areas; however, most of them fall short of achieving sustainable solutions. Recently a Living Lab methodology, discussed later in this paper, has been devised with the aim of addressing sustainability issues in ICT interventions. Living Lab methodology touts a user-centric, open innovation environment based on a multi-stakeholder partnership (public-private partnership) which enables real-life end users to take an active part in the research and innovation process (Smit, Herselman, Eloff, Ngassam, Venter, Ntawanga, Chuang and Van Greunen, 2011; Schumacher and Feurstein, 2007; Følstad, 2008).

In this paper we consider the Kgautswane community as our target environment to introduce a sustainable ICT intervention geared towards improving the socio-economic development of the area. A range of baseline studies were conducted using a Living Lab methodology. The results of the baseline studies formulated a basis for the identification, classification and prioritization of key challenges faced by the community. As a consequence, an eProcurement solution was selected for initial deployment in the community in order to address the most critical challenge. This sequence of activities or processes enabled us to compile a roadmap that can act as a blueprint for the deployment of sustainable ICT solutions in rural communities. The roadmap focuses on implementation of ICTs using a bottom-up (user-centric) approach in which implementation of interventions is driven by community needs. The objective of this paper is to demonstrate the applicability of a proposed roadmap using a case study of an eProcurement solution that was conceptualized, developed and deployed in the Kgautswane community in South Africa.

Subsequent sections of the paper are structured as follows: the second section covers the socio-economic development in South Africa as an emerging economy and in particular the Kgautswane community. The third section presents the research methodology that includes an overview of the Living Lab methodology, research design, implementation, deployment and evaluation of an eProcurement solution in the area. The fourth section discusses the generic roadmap for the deployment of ICT solutions in rural areas that can be utilized as a blueprint for the deployment of sustainable similar solutions. The fifth section presents recommendations and conclusions.

SOCIO-ECONOMIC ENVIRONMENT IN KGAUTSWANE

Kgautswane Community-South Africa

Kgautswane is a community in the Sekhukhune district municipality in Limpopo province, South Africa. The community is made up of a series of 20 villages with a population of about 120,000 people (Gumede et al., 2008). Unemployment is widespread, commercial farming is nonexistent, and crops like maize are scantly grown by villagers for subsistence purposes. Water is scarce, although boreholes and rivers are within walking distance of all villages (Venter and Venkatesh, 2010). The main economic activities center on small-scale trading and slate mining. There are about 130 small traders in the community, which are the only conveniently situated suppliers of essential foodstuff within the community.

The following general factors characterize the Kgautswane community (Friedland, Merz and van Rensberg, 2008):

- Fixed line communication is virtually non-existent with only a very few connection points
- No tarmac roads and municipal services, such as sanitation, garbage removal and running water are available
- There is lack of statistics, such as unemployment rate, average household income and, average household size
- The area is dry with erratic rains

The community is serviced by a well-established and active Multi-Purpose Community Centre (MPCC) that hosts the community's postal, library and policing services. A functional computer training laboratory that offers ICT training to the local community is also housed at the MPCC. Furthermore, the MPCC serves as the base for the sociopreneur (intermediary partners). Sociopreneurs are selected members of the community that undergo specialized training in order to enhance their skills. The sociopreneurs are facilitators for a number of socio-economic activities for the community, such as coordinating the interaction between the small scale retailers in the community and suppliers, offering front desk and outreach capacity at the MPCC and other tele-centers where they are deployed.

The Kgautswane community is equipped with a reliable mobile data communication system with new satellites being installed in other areas. Most people in the community own lower-end smartphones and use Vodacom[1] as a mobile service provider. The following section discusses examples of existing ICT interventions in rural areas that have similar characteristics as the Kgautswane community.

Existing Interventions @Rural

Rural areas in emerging economies like South Africa are often characterized by inadequate infrastructure, such as poor roads, inadequate health facilities, unreliable electricity and low-income generating activities. Various ICT solutions interventions that leverage on the high usage of mobile phones in rural areas have proven to help overcome some challenges faced by rural masses in their daily lives. For example, India boasts a large number of such projects in health, education and agriculture. ICT and specifically the mobile technology, provides seamless access to information even in rural communities; this in turns drives innovation, empowers rural communities and people to develop, and

[1] Vodacom is one of South Africa's mobile telephone services provider.

provides a solution to many pain points. Mobile phone based ICT interventions that have made positive impacts on the lives of people in communities where they are implemented include (UNESC, 2009, Jeremy et al., 2007):

- Mobile banking that enable users from rural communities to conduct transactions on their accounts using a mobile phone
- Mobile health (m-health) initiatives in which mobile phones are used for various activities in the health sector, such as providing information on available medical facilities in rural areas so that communities can know in advance before travelling long distances
- Agriculture information where useful agricultural related information, such as weather forecast is effectively delivered to farmers through mobile devices

Positive impacts of successful ICT implementation in rural communities include:

- Improved access to markets
- Access to employment opportunities
- Access to financial support and services
- Improved education and healthcare practices

The increasing use of ICT among rural communities provides an opportunity to leverage the existing infrastructure and develop ICT based solutions aiming at alleviating poverty and contributing towards the socio-economic development of rural areas. There exists a need, however, to study these projects for critical sustainability, scalability and impact factors. ICT interventions in most rural areas find themselves susceptible to the top-down approach (Etta and Wahamahiu, 2003). Other authors argue that the top-down approach imposes solutions on rural communities as opposed to community needs-driven solutions. Top-down approaches have proven to fail to attain sustainability of implemented solutions. Friedman (1992) argues that a bottom-up, participatory approach to solving a problem with the society is likely to provide better results than the top-down approach. A more participatory approach provides solutions from the community's viewpoint (Smit et al., 2011).

The roadmap for ICT solution deployment in rural areas being presented in this paper is based on a bottom-up approach through the use of a Living Lab research methodology. Results of the application and evaluation of a roadmap proves that the bottom-up approach can guarantee adoption and sustainability of ICT interventions in rural areas. The following section provides an overview of the Living Lab methodology and how it was utilized in the current research.

Living Lab Research Methodology

Research methodology is defined as specific ways and techniques that can be used to understand a phenomenon (Limpanitgul, 2009). Various research methodologies have been invented and utilized in conducting research in different fields of study. A Living Lab research methodology, invented over the past few years, has gained popularity and is having a great impact in the way research is conducted (MacDonald and Associates, 2004). Originally introduced by Professor William Mitchell of the Media Lab and School of Architecture and City Planning, MIT Boston, Living Lab was initially used to design home-like environments to test architectural ideas (Core Labs, 2006). Recently, the idea is spreading and being utilized in conducting research in various fields including Information Systems (IS) research (Følstad, 2008).

Literature indicates that there is lack of a consensus on the definition of a Living Lab and a number of definitions for a Living Lab exist in literature (Guzman, Schaffers, Bilicki, Merz, and Valenzuela 2008; Merz, de Louw and Ullrich, 2007, Schaffers, Guzman, Navarro and Merz, 2010). For the purposes of this article a Living Lab is defined as: a real environment, user-centered, open innovation method based on a multi-stakeholder partnership (public-private-people) which enables real-life end users to take an active role in the research, development and innovation process (Ec.eoropa.eu, 2010; Smit et al., 2011). The definition addresses four dimensions forming the basis of a Living Lab approach that was adopted in this study as follows (Smit et al., 2011; Følstad, 2008):

Real environment: This dimension refers to conducting the innovation process in a real environment as opposed to a test or laboratory environment. The dimension leads to a more realistic, applicable and ultimately a more suitable product or solution since various environmental factors, sometimes unforeseen, that are present and can influence the innovation process are dealt with immediately before the release of a final solution. During our research the Kgautswane community was the real environment to implement the initiative.

User-centric: This dimension refers to a group of real end users selected from the environment that gets involved throughout the innovation process, starting from conceptualization of the idea, requirements definition, design, implementation and evaluation. User-centric ensures that the product of the innovation process to be deployed add value and is suitable for the end users. During the baseline studies, a sample was selected to identify the general challenges the community faces. After the identification of the critical challenge, a smaller group was selected to be actively involved in the innovation process.

Open-innovation: This dimension proposes the involvement of other stakeholders, outside traditional organization boundaries (for example service providers companies, non-governmental organizations, and universities) in the innovation process. In contrast to closed-innovation where firms/researchers use internal resources only, open-innovation suggests the use of both external and internal resources during the innovation process. In this study various stakeholders were consulted and participated towards the development of the solution that was proposed to solve one of the critical challenges in the community.

Multi-stakeholder: This dimension follows open-innovation where various stakeholders are involved in the innovation process. Different categories of stakeholders, for example, real end users, innovators, policy-makers, researchers and service providers are all included in the innovation process. In this study, the following stakeholders were involved in innovation process: SAP Research, universities, product suppliers, Vodacom and real end users.

OUR INTERVENTION

This section outlines the intervention by discussing the four main activities that encapsulated the entire intervention, including: baseline studies, solution development, deployment and socio-economic impact assessment. The proposed intervention in the Kgautswane community was implemented following the Living Lab approach in which the above four main activities were carried out. These activities formed the basis of the roadmap presented later in this paper.

Baseline Studies

Baseline socioeconomic studies (also called socio-economic situation analysis) were conducted in Kgautswane community to identify challenges being faced as well as possible community-driven socio-economic ICT interventions that can be implemented to address the identified challenges. A number of

surveys were conducted in the area in order to get a full understanding of the community profile as well as the existing challenges. Most of the identified challenges were attributed to a lack of sufficient infrastructure as discussed in second section and possible general solutions to the challenges were suggested. Figure 1 shows opportunities that were identified as a result of the baseline studies that were conducted in the community.

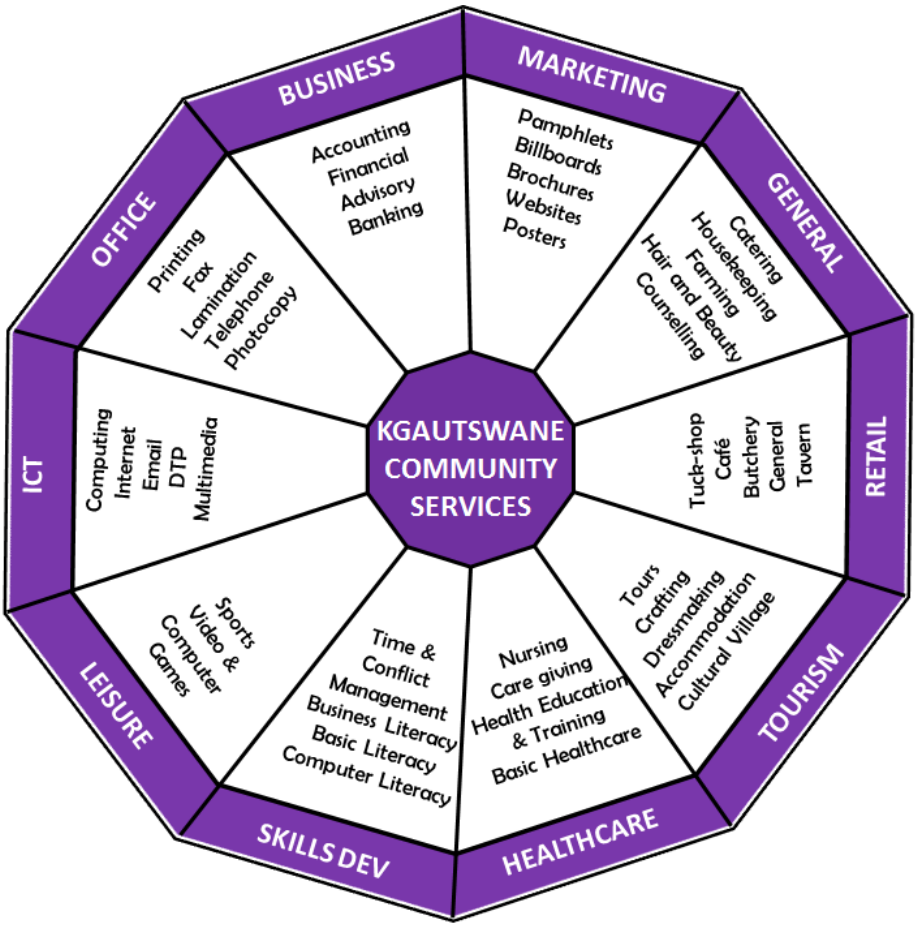

Figure 1. List of Potential Socio-Economic Services for the Kgautswane Community

The studies revealed that small-scale retailing is the main economic activity taking place in the area; there is a small-scale retailer approximately every 500 meters (Gumede et al., 2008). Types of small-scale retailers in Kgautswane community include: restaurants, coffee shops, grocery shops, butchery and bottle stores (Gumede et al., 2008; Rustica Survey, 2010). Furthermore, the results from the baseline socioeconomic studies also indicated that small-scale retailers in Kgautswane face a number of challenges when conducting their business, for example lack of stock, long distances and expensive transport to suppliers, and low stock turnover. These challenges result in a time consuming and expensive stock replenishment process, which creates consequences that are passed on to community members. For example, shops are closed for extended hours making it impossible for customers to get items on time and also items are expensive because shop owners wants to recover high costs associated with the stock replenishment process. Finally, the baseline studies also revealed that there was lack of collaboration amongst small-scale retailers.

Based on the challenges that were discovered, opportunities and needs of the community, an eProcurement solution was found to be critical and an implementation strategy was proposed for the

small scale traders in the area. Various stakeholders such as suppliers, academia, ICT researchers, small scale traders, sociopreneurs and community members participated in the project. Stakeholder coordination was achieved by utilizing a Living Lab approach discussed in the second section.

Twenty five participants from the community were selected to participate in the requirements elicitation, design, development and deployment of the eProcurement solution (Ntawanga, Eloff, Ngassam and Kandie, 2012). The 25 participants were selected based on their involvement in small scale retailing in the area and all the selected participants were either small scale shop owners or participate in operating shops. Figure 2 is an example of a typical small scale shop and its operators. The next section discusses the eProcurement solution.

Figure 2. Small Scale Shop and Example of Owners (Participants)

EProcurement

Overview

A mobile web eProcurement application was conceptualized, designed and implemented with the aim of solving challenges small-scale retailers in Kgautswane face especially during the stock replenishment process (Ntawanga, et al., 2012). The application enables registered users to login and navigate through the online and up-to-date supplier product catalogue. The online product catalogue contains real-time pricing information that enables retailers to budget stock purchases beforehand without need to travel to suppliers' premises. For example, the system displays the total amount to be paid for the quantity of selected items the user intends to order in real time. Orders are placed weekly and the supplier does bulk delivery two to three days after the day orders were placed.

Figure 3 is the interface of the main menu and product catalogue of the application.

Figure 3. User Interface for the Mobile eProcurement Application

Implementation

The application was developed using open source web application development tools based on the requirements and functionalities that were defined in consultations with the real end users and stakeholders. The motive for using open source was to ensure the application's compatibility with a variety of other technologies running on lower-end smart phones that are widely used in the community.

The following are the main development tools that were used:

- MySQL DBMS was utilized to implement a database to store two types of information
  - Application data, for example, product catalogue information
  - Transactional data, for example, order details
- PhP was used to develop the mobile web interface of the application
- Apache web server was used as the application server for the components developed for the system
- Apache Geronimo was used to run the web services that were implemented in the application

The application runs on a number of mobile web browsers including Opera Mini and proprietary mobile phone browsers.

Deployment

A final prototype was rolled out to all the 25 participating users after completion of several pilot deployment iterations that were conducted in order to get the users' input during the development of the application. Different mobile phone types such as HTC Legend, HTC Wildfire and Nokia E52 were given to different participants during the roll out in order to determine which mobile phones are more suitable to run the application, taking into consideration the environmental factors that exist in the area. The main deployment and evaluation was conducted for a period of 10 months between February and November 2011.

Evaluation Results

User experience (UX) and impact assessment results were conducted. The UX results aimed at assessing the usability of the eProcurement application. During the UX evaluation systematic sampling was utilized to come up with nine retailers who were interviewed and observed while performing tasks using the system. Results indicated that users with little, if any, computer experience were able to successfully perform tasks on the system. Figure 4 indicates the summary of the selected key UX perspectives measured on a point 5-likert scale. The graph show the results obtained with confidence interval of 95%. Detailed UX results were dedicated to another publication (Ntawanga et al., 2012).

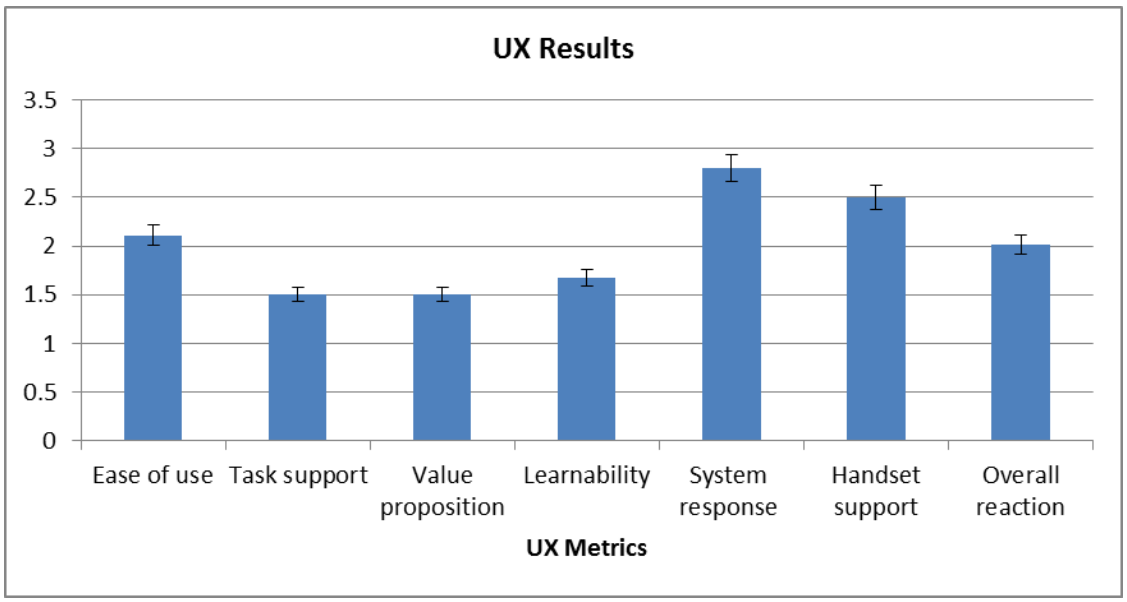

Figure 4. Summary of the User Experience Evaluation

Impact assessment evaluation was conducted in order to identify the critical challenges the deployment of the application addressed in the community. Three impact assessment evaluations were conducted; firstly, during the baseline studies, secondly, during development of the solution, and thirdly, after deployment of the solution. Impact assessment results indicated that the deployment of the application addressed a number of challenges in the community. For example, improved efficiency in the procurement process through the use of eProcurement resulted in more business time for the shop owners and savings on cost associated with the procurement process. The overall savings enabled retailers to increase the range of products being supplied to the community. Impact assessment procedure is discussed later in this paper that provides details on how the process can be conducted and the expected outcomes. The next section discusses the roadmap for ICT solution deployment in rural areas that can be regarded as a blueprint to implement similar solutions in other areas.

INTERVENTION OUTCOME: ROADMAP FOR ICT SOLUTION DEPLOYMENT IN RURAL AREAS

Definition of Roadmap

A roadmap refers to a needs-driven pathway that has to be followed in order to achieve an endeavor or a particular objective (Garcia and Bray, 1997). Therefore, a roadmap for ICT driven socio-economic

development is an aggregated set of steps followed in order to deploy a specific ICT solution for socio-economic development. This section presents a roadmap that can serve as a reference model for ICT solutions deployment in rural communities. The roadmap was developed following the successful implementation of a sustainable ICT intervention that helped to address critical socio-economic challenge in the Kgautswane community. It further highlights various vital phases and steps that must be followed in order to achieve similar results when deploying ICT solutions aimed at addressing rural community socio-economic challenges. Critical success factors for each phase or activity has been outlined.

Components of a Roadmap

Initiation

Initiation is the first step in the process of implementing ICT solution for socio-economic development in rural areas. Normally in this phase the project is defined and scoped following standard project management guidelines. This phase ensures preparing the required budgets and planning for resources that will help support the overall project as well as the deployment strategy. One critical aspect to consider at this stage is the knowledge of the area where the research ought to be undertaken. Poor knowledge of the area could result in challenges ranging from the actual strategy for facilitating interactions with stakeholders to the overall acceptance of the intervention by the targeted users. Hence, prior knowledge of the environment established during the initiation phase is of critical importance for the smooth running of the entire project lifespan. Examples of techniques that can be utilized to gather such prior knowledge for basing future interventions include:

- Previous projects or interventions
- Results of previous socio-economic studies

In our case study, results of previous interventions in the area were utilized as a basis for further work in the community. The impression left during the management of the prior intervention provided a sound foundation, not only from the community's point of view, but also with regard to the intended future initiative by the project team.

Success indicators for the initiation phase include:

- A project charter
- A work breakdown structure
- Resource consideration and budgeting
- Stakeholder involvement and environmental infrastructure that can have an impact on the project

Socio-Economic Studies

Sound socio-economic research is necessary prior to implementation and deployment of ICT solutions for rural communities. Socio-economic studies provide a clear understanding on the dynamics and pertinent needs of the community. Such studies serve as main drivers for the identification of what kind of solutions to be deployed in order to address the needs of the community. An analysis therefore follows to evaluate the feasibility of technology solutions to the identified challenges and needs of the community. This phase can be achieved by conducting ethnographic studies. Additional methodologies that can be used in this phase include: surveys through interviews, questionnaires and observation in order to capture the basket of challenges and needs of the community.

Socio-economic studies form the basis for the identification of all the niche areas where ICT could be of assistance for capacitating the targeted end-users. This also helps establish the ecosystem of partners required for the development and deployment of the selected intervention. Oftentimes not all stakeholders identified in a project form part of the ecosystem for the development and deployment of the selected ICT interventions.

In our case study, baseline studies were conducted using interviews, questionnaires and observations in the real environment in order to fully understand the environment as well as the challenges existing in the area. The outcome revealed that rural areas and residing communities are faced with many challenges ranging from infrastructures (road, transport, water and sanitation), to lack of visionary business activities (survival nature of businesses), as well as capacitating young members of the community with relevant mechanisms for accessing educational and entertainment services. The study also pointed out that the community was challenged by the lack of facility and mechanism for ensuring efficient healthcare services and security was also one of the major challenges faced by community members. Furthermore, e-tourism was discovered to be one key activity that can be implemented in the area so as to boost socio-economic development.

Identification, Classification and Selection of Interventions

At this stage, outcomes of the socio-economic findings are collated, analyzed and classified. Since the project is about ICT intervention, it is necessary to differentiate between general challenges and those challenges for which solutions can be implemented through ICT (refer to Figure 1). Certainly, considerations of generic issues when implementing the selected ICT solution would be of importance at this stage.

As such, a good understanding of the challenges faced by a targeted user-group (community) within their current operations is important as it guides the selection of ICT products/solutions, which can help address the identified challenges. This requires close interaction with the group so that the project team is able to fully understand their operational context and make an ICT intervention that can be feasible and of valuable. Such interactions are important and help eliminate a situation where a product is designed and cannot be adopted, appropriated and sustained by role players in the group (Etta and Wahamahiu, 2003; Friedland, 2008).

From an ICT perspective, the overall process at this stage would entail the following steps:

- Identification of the basket of challenges and needs that are able to be resolved through ICT
- Classification of the challenges by order of priority or criticality depending on the urgency and feasibility of the need by the community
- Selection of one or more high ranking challenges based on the available budget required as set forth during the project initiation phase

The selected challenges would now constitute the present to be resolved from an ICT point of view during the remaining lifecycle of the project. The project would now run from this point forward within the selected target group and the steps that have to be taken to ensure entire participation of the all role-players. This guarantees efficient and effective implementation of the solution aimed at resolving the selected challenge from an ICT perspective and ensuring that the solution has a strong adoption and sustainability acumen. In fact, those challenges that would not be considered for implementation after this selection process would form part of the future work of the project once the current solution has been released in the community.

In our case study, the most critical intervention required for capacitating an identified target group was that of the development of a virtual-buying cooperative system for supporting the procurement value chain in the environment. The eProcurement solution to be developed would enable small scale traders in rural areas to overcome the challenge of doing long distance travelling for basic stock acquisition and also losing income when closing their shop during the stock replenishment process. All this will be developed on a mobile technology platform.

Implementation

Implementation here refers to the actual execution of the intervention and is regarded as the most critical part of the project. The identified ICT solution to be deployed needs to be analyzed, designed, developed and tested in a user-centric approach, taking into account the needs of the future user-groups.

One critical activity of this phase is the identification of all the necessary stakeholders to be involved during the development of the ICT driven socio-economic development initiatives. These stakeholders will form a collaborative ecosystem in order to achieve the desired goal. In any existing environment or activity there are participants with various roles. The identification is driven by the requirements of the intended solution to be deployed. Therefore, existing role players identified during socio-economic studies could be part of the ecosystem as well as new ones to be recruited as required. Roles and responsibilities of each stakeholder have to be clearly defined for the smooth running of the ecosystem. This step involves analyzing every identified stakeholder, specifying the existing role (if any) and assigning new roles. This process ensures that repetitions and conflicting responsibilities are eliminated in the ecosystem in order to improve efficiency and sustainability. Of course, the value proposition for stakeholder participation also has to be established so as to attract their participation in the endeavor.

To foster stakeholders' interactions and active participation in the development and deployment process of the solution, processes and methodologies are required. In our case study, a number of processes were put in place, for example, the Sekhukhune Living Lab, project management office and the sociopreneur cooperative. The sociopreneur cooperative played a very critical role in the project by being intermediary partners from within the community and gained trust from the community and users. The members of the cooperative underwent various trainings in order to equip them with skills in risk management, communication management, administration, and change management. This whole process enabled swift acceptance and adoption of the introduced ICT intervention in the community.

Impact Assessment

This phase helps ascertain that the intervention meets the intended expectations by having a positive impact on the lives of the targeted group. The phase should be triggered in parallel with the implementation of the intervention. Although the solution development is done taking into account end-user's input, the team should not forget that the most important aspect of the intervention is to ensure that the ICT intervention has an impact on the lives of the targeted group from a socio-economic development point of view. Impact assessment should thus be conducted after completion of every major phase of the project.

The first step in conducting an impact assessment is to identify impact parameters for all stakeholders directly or indirectly involved and those who benefit from the project. Impact assessment parameters or criteria are used to measure the impact of the intervention on the livelihoods of the people with focus on the socio-economic point of view. Impact on specific stakeholder is analyzed based on the impact parameters specific to that particular stakeholder. In order to make analysis of the impact a minimum of three impact assessments need to be conducted with the initial one being a baseline impact study (pre-

impact assessment) that is undertaken either before or as soon as the implementation effort has started. Apparently some elements of the socio-economic study could serve as input for shaping the baseline questionnaire but would not in any case prevent carrying such an impact study. Also, the presence of new stakeholders in the ecosystem would be of value for the definition of the baseline instrument to be used to conduct the study.

The second impact assessment also called the execution phase impact assessment is conducted once the first release of the solution has been deployed for piloting. Data gathering should be performed for frequent evaluation of the effect of the intervention on the stakeholders. The results of the execution phase impact assessment are fed back into the innovation process in order to polish up the solution before final release. This can be done iteratively until a suitable solution is obtained.

The recommended last impact assessment, which is often difficult to evaluate because it is usually close to the cycles undertaken during the solution release, should realistically take place after the solution has been released in the environment and operated for quite some time in an autonomous manner. The analysis of data gathered during all the three phases would quantitatively and qualitatively inform on the effect of the intervention on the targeted community.

Solution Deployment and Release

This phase represents the actual go-live of the intervention and stakeholders now take full responsibility/ownership of the deployed solution. In our case study, the eProcurement application fully operated by Sociopreneurs has been deployed and released to selected small scale traders. The sociopreneur receives orders in their central database and verify them before dispatching to the supplier for packaging and delivery.

Conclusion and Exit Strategy

For an ICT solution deployed in a rural community, a proper exit strategy should be put in place taking into consideration the fact that the intended purpose of the intervention is to make a socio-economic impact on the target group. The lifespan of the solution clearly depends on the business model as well as the value proposition that such an intervention could bring to the stakeholders. As such, the soundness of the foregoing would definitely contribute to the growth of the deployed ICT solution as well as concerted effort amongst stakeholders to strive for innovation and improvement of the existing solution so as to contribute to socio-economic development. The deployment of the intervention by expanding the geographical reach of the solution is also an indication that the intervention had the desired effect.

Figure 5 summarizes the roadmap for ICT solution deployment in rural areas that can be used as a blueprint for successful implementation of sustainable ICT initiative for socioeconomic development in rural areas.

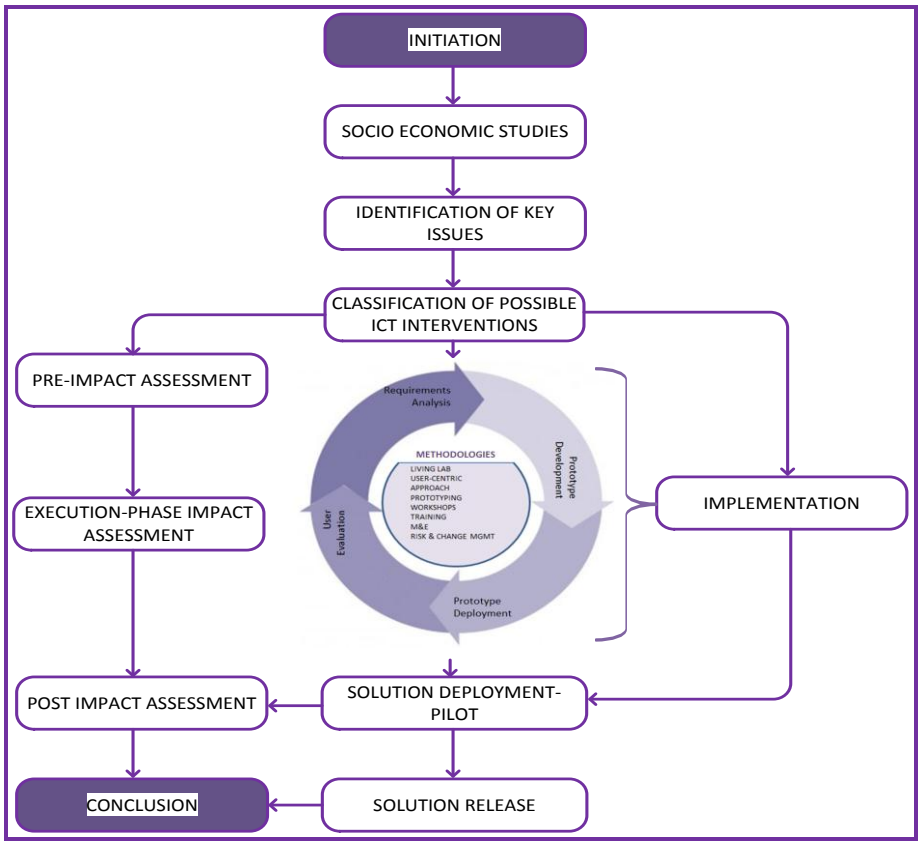

Figure 5. Roadmap for ICT Solution Deployment in Rural Areas

RECOMMENDATIONS AND CONCLUSIONS

In our pilot experimentations we intended to directly connect some parts of the informal economy to established markets that are currently indirectly connected. Our experiences with regard to the eProcurement deployment in Kgautswane have shown that an innovative business model combined with appropriate techniques and technologies can provide means to increase the bargaining power of the informal economy, formalize and digitally track previously informal business processes and thereby provide the basis for a more transparent and direct business relationship with the established economy.

Secondly, such innovations can form the basis for business transactions that previously have been impossible. For example, while having had no means of proving their reliability or creditworthiness in the past, rural small scale retailers now have a system at their disposal that tracks and documents each of their business transactions. This first important step provides the securities required for future business transactions such as financial services.

The most valuable outcome for the project has been through engagement with various stakeholders especially the small scale retailers (as real end users) and sociopreneurs (as intermediary partners). It is clear that local perceptions and views have a significant impact on the development, adoption and sustainability of systems such as this. Therefore it is recommended that similar projects should consider a longer period to engage with users and other partners with direct influence on the project outcome

prior and throughout the lifecycle of the project. Involvement should also translate in spending more time working in the communities and with the stakeholders.

The overall process followed to achieve the desired goal of the intervention was presented in this paper in a form of a blueprint that similar project could follow for the deployment of ICT solution in rural areas for socio-economic development. The model represents a valuable instrument that can be used in any similar project for rural areas.

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