

# An Architecture for future ICT services for Rural Areas

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**Abstract-** The pace of change and technological evolution has accelerated greatly over the last decades, with unequivocally positive transformations for societies, companies, and individuals. It is remarkable not only how dramatically the technologies in everyday use have changed, but also how easily society as a whole has adopted these innovations. The need for ICT service provision in rural areas has been targeted by different ICT stakeholders. This has been encouraged by ICT services which are available within many areas in the world. Most ICT researchers are targeting rural areas and providing different services ranging from, e-Commerce, e-Health, e-Government, e-Learning to mobile services. However, most of these services are affected by technological changes and as a result are not benefiting the targeted people. The case study approach, literature review, interviews and architectural development and experimentation are some of the research techniques to be used in the work reported in this paper.

**Keywords** – eServices, architecture, future of ICTs, ICT Road map

## 1. INTRODUCTION

During the past few years, a growing number of poor people have benefited from improved access to interactive communication [1]. The rapid uptake of mobile phones even in remote locations of low-income countries, together with the emergence of many innovative mobile applications and services, has radically increased the potential for ICT to play a constructive role in the fight against poverty [1]. At the same time, the role of the poor in this context is transforming, increasingly shifting from one of passive consumption of ICT toward one of active use and participation in the production of ICT goods and services, thus giving greater importance to ICT in development and poverty reduction strategies [2].

## II. FUTURE ICT ARCHITECTURE

The proposed ICT architecture should address the following issues in rural areas:

**Enabling basic services:** Access to primary services such as healthcare and education is a challenge for most rural citizens in developing markets; ICT enables governments and nongovernmental organizations (NGOs) to broaden their provision of these vital services [1]. A number of nonprofit organizations are using mobile networks to deliver m-health services, such as patient data collection and the dissemination of health information, to poor, rural populations throughout Africa [1].

**Enabling livelihoods:** Almost one-fourth of the world's population lives below the poverty line, on less than US\$1.25 per day [1]. ICT can help governments and international nonprofit organizations improve the purchasing power of low-income groups. In the agriculture sector, for example, farmers can obtain instant weather information and market prices for their crops on their mobile phones [1].

## III. SIYAKHULA LIVING LAB PROJECTS

The deployment and testing of this system is done within the context of the Siyakhula Living Lab (SLL) undertaken in Dwesa [3]. SLL aims to develop the marginalized community by equipping people in the area with the necessary technological skills to be able to support projects deployed [4]. A lot of e-Services have been deployed for the community. However, due to the current limitations of the e-Services already available for the community such as:

- Unable to run on mobile phones
- Stand alone applications
- Mainly written in English

We have noticed that due to ICT changes and other technological changes and with the future technological projections been made, there is need to accommodate the future.

## IV. ARCHITECTURAL DESIGN CONSIDERATIONS

The architecture development in this paper is proposed to cater for the future of ICT services. The architecture should provide a base for the future ICT services. The idea is to propose a technological ICT platform which could be used by ICT stakeholders in developing services for rural areas. The architecture is based on different entities such as:

- Rural Users
- Expected ICT services
- Future Technological projections
- User Access
- Different ICT factors in rural areas

The rural users within the SLL are interviewed to get different views on the future ICT expectations and how services could be accessed. Literature review and interviews of ICT experts are done to get an insight of the future. This provides different opinions on different future technological projections as proposed by MacManus [5] such as:

- Cloud computing
- Growth of internet services
- Growth of mobile applications
- Semantic web
- Social networks

- Intelligent systems

Different factors which affect ICT services and rural areas are also considered in assisting to develop the ICT technological architecture. The proposed architecture is supposed to improve ICT service delivery and improve the rural livelihoods. The authors of this paper appreciate a lot of work currently underway in most countries to improve rural areas through ICTs. This is also the major objective of the SLL, to see the rural communities developed through ICTs. However, most of the ICT initiatives are failing to successfully benefit the rural communities due to many factors which could include poor planning. Therefore, in planning for the future of ICTs, there is need for ICT stakeholders to provide services which could be accessible at low cost and benefit rural people.

### V. ICT ARCHITECTURE DEVELOPMENT

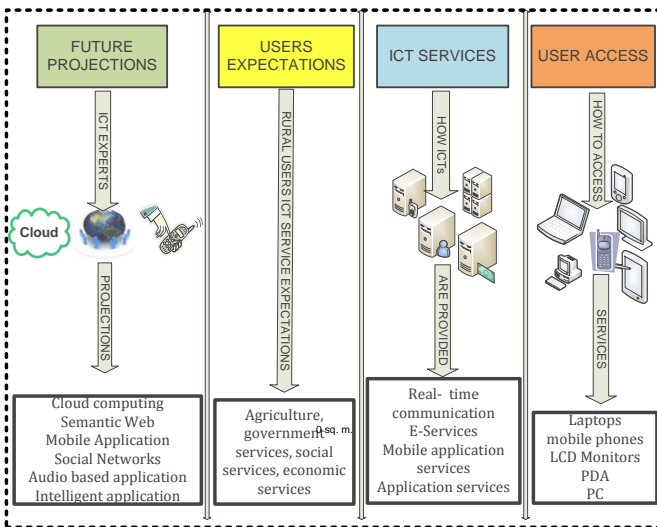


Figure 1: Future ICT architecture

The architecture also considers the different factors which affect ICTs in rural areas. These factors range from social, economic and technological factors. Future technological projections, expected ICT services and how users access the services form the key components of the discussed platform in Figure 1. Having the projections such as cloud computing, social networks, mobile applications and intelligent systems, the architecture attempts to provide a platform for future expectations. The services should be accessed from different ICT devices as listed in Figure 1, at minimal cost for the benefit of the rural ICT users.

### VI. EXPECTED FINDINGS

Before concluding the research within the Dwesa community and based on the authors' experience on the ICTs in rural areas, we expected users to suggest services which will allow them to generate some income. And from the baseline study which was completed in 2009 for the Dwesa communities, social services such as sports clubs, community halls and other services which keep the youth a bit busy were proposed. Considering the fact that many people in rural areas do not

have sufficient income even for basic services, the architecture proposed in this paper should provide a leeway for business models. We propose a simple technical business model for ICT services which could allow rural users to benefit from the deployed services.

This architecture is to be deployed as part of the ICT road map development project which is currently underway, but should be generic enough to cater for all other rural areas in Africa. This means ICT services which could improve agricultural services in rural areas should also be considered. The architecture should enable the deployment of any e-Service which could benefit the rural areas. The ICT services should allow real – time communications, accessible on mobile phones, accessed from application servers possibly through cloud computing. This could encourage the social networking services and sharing of ICT resources. As language is a barrier to most people in rural areas, localization of the ICT services so that the services are written in local languages or could be audio based services are some of the issues to be addressed from the architecture.

### VII. CONCLUSION

Rural areas have different ICT services currently deployed for them. Most of these services are available through schools and clinics for example within the SLL used as the case study in this paper. There is need to prepare for the future as technology keeps changing. Thus this paper proposes an ICT architecture which could be used to offer sustainable ICT services in rural areas. These ICT services are based on the rural users' expectations and the architecture should allow the users to benefit from the services and earn a living from some of the services. The work reported in this paper is part of the project undertaken by one of the authors which will produce an ICT road map for e-Services in rural areas.

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