

Use of low cost wireless communication technology for education in rural Kenya

B. Mayeku, J.Kilwake

Masinde Muliro University of Science and Technology,
P.O.Box 190,
50100 Kakamega, Kenya
mayekub@yahoo.com
jkilwake@mmust.ac.ke

F.Bertarelli

Università degli Studi di Modena e Reggio Emilia,
Via Vignolese 905/b,
41125 Modena, Italy:
fabio.bertarelli@unimore.it

Abstract: With the advent of mobile revolution, the emerging mobile technologies can support a broad range of learning activities on a variety of mobile devices, a concept referred to as mobile learning. The combination of wireless communication technology and mobile computing is resulting in rapid transformations of the educational world. This paper explores the use of low cost wireless technology in combination with other existing technologies to bring education to rural and pastoralist tribes in Kenya who would otherwise not have access to education.

Keywords-Mobile technology; wireless communication; education; rural area;

I. INTRODUCTION

Mobile devices are becoming increasingly powerful and accessible as wireless networks cover most of our daily environment. In Kenya, mobile phones are having an amazing impact everywhere especially in marginalized communities like rural areas and pastoralist communities. Once disconnected from the rest of the country and so marginalized, since the emergence of mobile phone technology these communities have at least now become part of the country's journey to progress. There are a wide range of considerable appeals that has led to the massive embrace of mobile technology for their educational use. Some of the unique properties of mobile devices that make them appealing for education use among others include: Portability, social interactivity, availability, context sensitivity, connectivity and individuality. There portability permits the learners' mobility and makes information access more convenient for the learners and teachers. The affordability and availability of the devices like mobile phones by learners can offer students more opportunities to work on academic projects individually, to support group projects or even explore class work with fellow students. Furthermore, mobile devices can support social interactivity in that they can allow data exchange and collaboration with other learners. Mobile devices can both gather and respond to real or simulated data unique to the current location, environment and time [1] thus context sensitive. One of the vital aspects of an effective learning

environment is the presence of a learning community. A learning community comprises of timely, meaningful interaction among the community, thus bringing a normal class room situation in place. The backbone for a rich, collaborative and conversational experience is interaction. This paper explores the use of low cost wireless technology in combination with other existing technologies to bring education to rural and pastoralist tribes in Kenya who would otherwise not have access to education.

II. THE COMPLETE E-LEARNING SYSTEM

To effectively implement the project it was decided to start with the use of technology already available in the country or low-cost technologies that are readily available. In this way we want to reduce the initial start-up of the system in terms of cost and complexity and then gradually increase the technological content according to the actual user needs. Later it may be possible to undertake new designs with technologies that are best suited for this purpose; the desired scenario is depicted in fig 1. The heart of the project lies in the possibility to connect rural areas with low-cost systems such as wireless modems. The system provides for the presence of one or more classrooms equipped with devices dedicated to e-learning and Distance Learning as well as the implementation of various peripheral centers that can disseminate lessons with low-cost devices.

The description of the individual components is now briefly given:

A - Section A is a classroom of modest size consisting of: digital board [2], tablet PC and videoconferencing device [3]. In this way it is possible to search the multimedia repository that has video and audio content of lessons, in addition to the material that digital board can store electronically. The sections of this type can be more than one, geographically distributed, so that you can draw from more educational facilities or training expertise

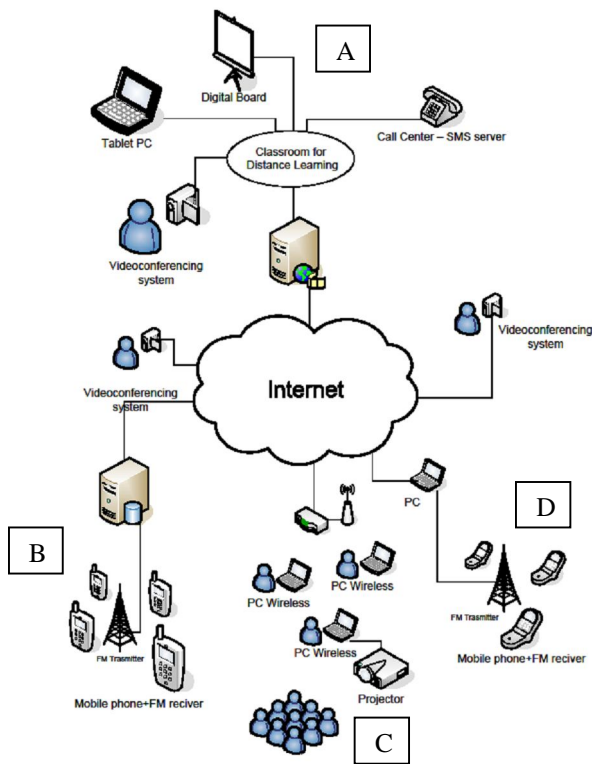


Figure 1 The complete scenario

Let's look at the configuration of possible stations that could be deployed in rural areas.

C - Station with a wireless modem and Mini-Tower / Laptop Computer. It's the typical case where you are to operate: the area covered by wireless local area network. The spread in these areas of PCs like net-books and low cost wireless devices create the conditions to be able to easily implement virtual classrooms. The problem of rural areas is the electric power that can be bypassed by using solar cells.

Interactivity: the creation of virtual classrooms is necessary to provide a system capable of guaranteeing a certain similarity between student and speaker to receive feedback from students involved in the lesson on the subjects addressed. The lesson beyond being an important formative moment and active (not passive ...) would acquire an exchange value of expanding the boundaries of that region to the number of the virtual classrooms.

. That which you have is actually much less than what you expect to have. In this sense, the stations B and D are considered.

D - Thinking about using a simple phone with a built-in FM receiver already puts one in a position to benefit from e-

learning The station has an FM transmitter as a terminal capable of transmitting within a few meters the audio signal from the stations of type A.

B - Section B it can be considered as a section D "enhanced" in this case instead of a PC connected to the station A, this is a server that acts as a repository for lessons that have already taken place.

III. INTERACTIVITY

For stations B and D iteration focuses on communications at low cost, e.g. SMS or short calls. It is with this perspective that the Instant Messaging Server and Call Center station A should be considered. This way you can get clarification on the topics or simply require the transmission of a lecture from a server or from a station of type B.

To decentralize the management system the implementation of a small server handling SMS messages directly on the server station type B could be considered.

The main advantage of this choice is so as not to depend on the connectivity of station B to the central station.

Scheduling training sessions for teachers and practitioners in education and training is not just a way to keep up the quality of topics covered, but also a personal satisfaction for those who come to work "on the ground". The sense that the computer networking technology while being transparent to its users, has opened great opportunities for cultural exchange and new forms of association that have in fact shortened the physical limit of distance, bringing together thoughts and ideas.

IV. SIGNIFICANCE OF THE APPLICATION SYSTEM

The demonstration of the effective use of mobile technologies for distance education will mean that this technology and the findings can be readily adapted for use by the public and private education sectors to enable access to higher education by many people especially those from marginalized communities (rural and pastoralized) and parents who pursuing education means sacrifice on family time due to the rigidity of the available distance learning approaches. The application may be significant to scholars in the field of distance education and educational technology, researchers in education and educational instructors. It will also be useful to designers and developers of m-learning environments to create effective m-learning environments for distance learning.

REFERENCES

- [1] Naismith, L, Lonsdale, P, Vavoula, G, Sharples, M (2007). Literature Review in Mobile Technologies and Learning.
- [2] G.Guaraldi, E.Genovese, F. Bertarelli,M. Corradini, J. Kilwake, B. Mayeku(2010),Ict and university education: enhanced didactic tools for person with special needs, Tech.2010 MMUST
- [3] H.323 Protocol <http://www.iec.org>