

MobilED: A step backwards to look ahead.

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ABSTRACT

MobilED started as an international collaborative project to facilitate and support teaching and learning through the creation and support of learning environments using mobile technology. This paper provides an overview of the theoretical underpinning and reflects on the project methodology. We discuss and analyse what worked and what didn't work. Problems encountered such as navigation and entry to schools with set curricula and limited time are articulated and some contextualised recommendations are made.

Author Keywords

IT – Information Technology, Semi-summative assessment, Audio-wiki, Reflective practitioners, Design research, Formative assessment, Text-to-speech, Speech Synthesizer, IVR – Interactive Voice Response, DTMF – Dual Tone Multi Frequency.

INTRODUCTION

The rapid technological advances in the field of technology development and the widespread integration of the device in social and cultural practices (Kress & Pachler, 2007), has created unique opportunities for educators, researchers and practitioners. Mobile learning has developed from a few small scale pilots to a set of significant projects in schools, workplaces, museums, cities and rural areas around the world (Sharples, Sánchez, Milrad, & Vavoula, 2007).

Contrary to trends in the developed world, where the PC and Internet-connectivity is almost ubiquitous, mobile phones are currently the most important networked knowledge exchange technology used in the developing world. From a developing country perspective, features such as limited or no dependence on permanent electricity supply, easy maintenance, easy to use audio and text interfaces and the affordability of these devices are critical. While the African reality presents well documented limitations (Abungu, 2002; Akinboade & Lalthapersad-Pillay, 2005; Czerniewicz, 2004; Ford & Whaley, 2003; Klein, 1993; Nwauche, 2005; Traxler & Leach, 2006) it also records a rapidly growing mobile cellular growth rate. According to the International Telecommunications Union, African mobile cellular growth rate has been the highest of any region over the past 5 years, averaging close to 60% year on year with a recorded figure of 76 million users on the African continent at the end of 2004. Joel Selanikio the co-founder of DataDyne states:

...this revolution of personally-financed wirelessly-connected computers largely goes unnoticed by the international development community, and because their paradigm revolves around desktops and laptops they spend millions developing specialized laptops for school children in developing countries, which will surely only ever reach a small fraction of them, while the network of invisible computers continues its exponential penetration into those same regions, below the radar (Selanikio, 2008).

MobilED (Mobile Education) (2005) started as an international collaborative project that consisted of collaboration between, the South African Meraka Institute of the CSIR, University of Pretoria, Tswane University of Technology and the University of Pretoria, and international partners, including the Media Lab of University of Art and Design Helsinki (Finland), Escola do Futuro Universidade de São Paulo (Brazil) and the WikiMedia Foundation (United States).

In the absence of desktop computers and ubiquitous internet access, MobilED endeavours to research alternative access to the information age so as to prepare learners for full participation in the knowledge society. Within the initiative there is an acknowledgement that a new approach or model to integrating technology into the classroom is needed for developing regions. The initiative strives firstly to contribute to scientific and technical knowledge on how groups of young people are using mobile devices in everyday knowledge sharing and problem-solving situations, both in the developed and developing worlds. A secondary purpose is to develop a suite of technology platforms to support the use of mobile technology in education. This includes developing research-based models and scenarios of how mobile phones could be used for teaching, learning and empowerment of students within and outside the school context.

METHODOLOGY

Reeves, Herrington and Oliver (2005, p.96) recommends design research as a particularly appropriate approach to socially responsible inquiry. Van den Akker (1999) describes design research as:

...more than most other research approaches, development research aims at making both practical and scientific contributions. In the search for innovative 'solutions' for educational problems, interaction with practitioners... is essential. The ultimate aim is not to test whether theory, when applied to practice, is a good predictor of events...(but) is it possible to create a practical and effective intervention for an existing problem or intended change in the real world?(p.8-9)

Several significant development iterations were planned. The first of these iterations was the development, implementation and evaluation of a mobile audio-wiki. The study was based on a "pragmatic epistemology that regards learning theory as being collaboratively shaped by researchers and practitioners" (Reeves, 2000) with the overall goal of enabling participation in the knowledge society. This participation was aimed at lower end mobile phone users, giving them access to information on the Internet while simultaneously constructing "design principles" which can inform future iterations. This paper reflects on the lessons learnt and insight gained.

THEORETICAL UNDERPINNING

Garcia and Quek point to the difficulty of defining the actual object of information technology systems research "*Is the object of research in information systems of a technological or social nature? (Garcia & Quek, 1997, p.450)*". One of the problems we faced in the project was to develop a common understanding and vocabulary between the researchers, practitioners and the development team. The research encompasses two disciplines, Information Technology Research (engineering endeavour) and Educational Research (social endeavour). The development and feedback from one domain would influence and report success in the other. There is thus a trans-discipline interaction that needed to be navigated in order to achieve the desired results. The research needed to acknowledge the existence of two worlds, an intransitive world (natural) in which the engineering endeavour would take place, and a transitive world where the social endeavour would take place and is social and historical (Bhaskar, 1991; Dobson, 2002). Gamache (2002) states that "*all practice is rooted in some theoretical framework, if not explicitly, then implicitly. Since methods are based upon epistemology, and epistemology is based on ontology, educational practice is never value-free.*" As we approached the research project with differing epistemological and ontological perspectives, it became apparent to us, as a research team, that we needed a common underpinning. This research was thus approached from a critical realist perspective, providing a basis for bridging the dualism between subjective and objective views as "*real objects are subject to value-laden observation (Dobson, 2002)*"

The philosophical considerations in this research was thus to be the common ground for practitioners in both domains. From a critical realist view our research acknowledges that

...there is no conflict between seeing scientific views as being about objectively given real words, and understanding our beliefs about them as subject to all kinds of historical and other determinations.(Norris, 1999)

METHODOLOGY

Plomp (2006) defines educational design research as the systematic study of designing, developing and evaluating educational interventions as solutions for complex problems in educational practice. Reeves (2000) states that "*researchers with development goals are focused on the dual objective of developing creative approaches to solving human teaching and learning, and performance problems while at the same time constructing a body of design principles that can guide future development efforts.(p.7)*" These correlate with the MobileED technical and developmental objectives:

- Explore and comprehend the cultural, social and organizational context of young people in and out of in their use of mobile phones.
- Develop research-based models and scenarios of how mobile phones could be used for teaching, learning and empowerment of students within and outside the school context.
- Develop concepts, prototypes and platforms that will facilitate and support the models and scenarios developed.
- Test, evaluate and disseminate the scenarios, models, concepts, prototypes and platforms in the four countries

Each phase of the study covers four main phases (Mc Kenney, Nieveen, & Van den Akker, 2006; Nieveen, Mc Kenney, & Van den Akker, 2006; Plomp, 2006; Richey, Klein, & Nelson, 1996), adapted from the model used by Mc Kenney (2001). These stages have been tailored to the study and are: Needs and context analysis, prototyping stage and assessment and systematic reflection.

Nature of conclusions

Where instructional development typically builds on previous research, developmental research, in contrast, attempts to produce the models and principals that guide the design, development and evaluation processes (Richey et al., 1996). Development research is regarded as having a dual focus (Richey et al., 1996; Van den Akker & Plomp, 1993), delivering:

- *Design principles.* Plomp (2006) refers to this as intervention theory while diSessa et al.(2004) calls it ontological innovations, Cobb et al.(2001) domain specific theories and Van den Akker (1999) heuristics.
- *Prototypical product.*

The conclusions are generated in context and include the conditions that promote successful use of the product and its impact (Richey et al., 1996).

REFLECTION ON METHODOLOGY FOLLOWED

The first stage of the initiative was centred on the development of an audio-wiki for the remote access and retrieval of reference material and information. We decided to investigate the use of low-cost mobile phones which are readily available in Africa.

Preliminary Research

The research around the audio-wiki was driven by researchers from the University of Art and Design in Helsinki and the University of Helsinki. The purpose was to establish the pedagogical underpinning of the technology solution and how it should be constructed in an application and lesson. The audio-wiki intervention was conceptualised and envisaged to support the following:

- Student and group-centred learning
- Project-based learning
- Problem solving
- Inquiry learning

The University of Art and Design in Helsinki developed an audio-visual mock-up of a scenario where the typical use of this potential service was mimicked. This audio-visual was shown to the technical team and followed by a workshop with the researchers that initially conceptualised the idea. From the meeting and the audio-visual, the design team extracted the requirements that related to technical functionality.

Prototyping

Two pilots were convened at two schools with approximately 120 learners being involved. A researcher from the University of Art and Design in Helsinki, was the main facilitator during the first pilot and was assisted by the two “reflective practitioners” (Reeves, 2006) from the University of Pretoria that were also educators of the particular groups of students at the time. The second pilot was undertaken at another school where a Meraka researcher and the same two researchers from the University of Pretoria, assisted one of the educators at the particular school to facilitate the lesson. During these pilots the students’ use of the service was monitored and technical problems or difficulties were captured. Interviews were conducted with students, educators and the facilitators, before, during and after each session to facilitate formative assessment (Plomp, 2006).

For the first pilot a complete version of the audio-wiki development was undertaken and piloted in one school. The audio-wiki application allows the learner to use the standard text messaging capability of the mobile phone (SMS) to request an article from the MobilED platform. This is done by entering a key word relating to the topic of interest, and sending the message to the phone number assigned to the MobilED platform. The service calls the user, and starts reading the Wikipedia article from the top, using interactive voice response (IVR) and text-to-speech (TTS) technologies. It reads the article to the user using a synthesised (computer-generated) voice in combination with pre-recorded voice prompts, and accepts input from the user via DTMF (Dual Tone Multi Frequency)/Touchtone key presses. Each article is broken up into sections (it uses the sections as they appear in the Wikipedia article) in order for the service to allow the user to navigate through the article or between related articles.



Figure 1. Send SMS with search term to MobilED number.

A user also had the opportunity to contribute information to the information source (local Media-Wiki server) by recording his/her voice over the telephone and adding it to an existing article.



Figure 2. A user can make a voice recording with the mobile phone and add it to an article.

A second pilot was convened at another school. The results of the first pilot were used as feedback to refine the development for implementation in the next development iteration. Various feedback functionalities were added and the navigation interface was refined.

Assessment

Semi-summative assessment (Nieveen et al., 2006) was conducted after the conclusion of the second pilot. The write-up consisted of two masters' studies at the University of Pretoria (Batchelor, 2006; Botha, 2006) and approximately ten conference articles that were accepted for publication.

EVALUATION

The project team tried to be very critical of the whole process in order to establish a feasible methodology for this kind of project development in future. This section focuses on what worked and what didn't work.

The preliminary research was strongly based on computer, technology and mobile use in the developed world and carried primarily euro centric ideas and views. One of the reasons for this was due to the fact that so little was published regarding the use of mobile technology in learning environments in the developing world. This part of the research was also mainly conducted by the Finish partners, who at that stage had a limited understanding of the South African context. The South African researchers only started with research in this field at the time and were not in a good position to qualify the validity of applying research findings of the developed world in this context.

We believe that the South African context is very different to that of the typical developed or developing worlds. On the one side, the general public, including learners from a more disadvantaged background, is very used to mobile technology. They either own mobile phones themselves or have access to it, making them very aware of the functionalities and possibilities provided by this technology. This degree of comfort with the technology was not

necessarily expected by the researchers, although it became quite clear over the last few years. On the other hand, the South African public uses mobile phone technology mostly for personal communications and was not very used to the value added services that are typically provided by governments and the service industries in developed countries. This kind of value added services are mostly information based and often makes use of synthesised voices to convey the information via speech over the communication line (mobile or fixed line). Since the audio-wiki application relies on a text-to-speech converter to deliver Wikipedia information via a synthesised voice, this was something that would definitely have a big influence on the acceptability of such a service.

Although the audio-visual mock-up captured many of the activities that the technology was expected to support, finer nuances of the interface and technical specification was left hanging and open to interpretation by the developers. This open ended brief caused uncertainty within the technical design team and caused conflicting expectations.

Access to schools can be very challenging as curricula are in place and needs to be adhered to and limited time is given to each subject. Furthermore the position of educator as final decision maker in a classroom is what eventually determines the possibility or success of any intervention. The technical team envisaged this pilot more as a testing phase of the technology than an actual pilot. As we piloted with immature technology, the educators expressed frustration at what they perceived as a lack of planning. The technical team was surprised by this reaction of the educators and we realised that the educators, developers and researchers had very different expectations of the pilot.

Implicit expectations, whether culturally biased or domain specific, were never formally addressed. In the long term, this caused a break down in communication due to misunderstandings. This was further compounded by the physical distance between initiative members as the research was mainly driven by the Finish partners and the development by the Meraka Institute.

RECOMENDATIONS

When working across two domains, the needs and expectations inherent in the disciplines should never be underestimated and needs to be accommodated. There is a very real need for practitioners that has a grasp on both domains to facilitate discussion and act as interpreters between the different worlds. Implicit expectations and agendas need to be explicitly stated and bought into. This kind of project requires a different perspective to what either domain are comfortable with working in and flexibility is needed to accommodate each others perceptions. One should however not confuse flexibility with informal working procedures. The need for establishing commonality increases exponentially as project partners are physically distanced from one another, limiting face to face communication. It is important for the design team to develop a common language and understanding, grounded in models of best practice and formalised agreements, articulating expectations from all participants.

It is not recommended to use preciously gained entrance to an education institution for initial piloting of a prototype. Smaller iterations with a limited group of representative individuals and critical colleagues should be used for initial piloting and feedback. In this way, the sanctity of the classroom is respected as the educator can utilise the technology when it suits them in a further iteration with more stable technology. Ideally this educator should form part of the initial discussion and pilot group. In this way, very applicable and practical feedback in terms of requirements can be expected during the preliminary development and piloting. Ownership is critical to sustainable development and implementation and therefore the educators' participation should never be underestimated.

Planning and initial research need to be strongly contextualised in localised conditions. Assumptions of research findings in different contexts should be carefully scrutinised and tested for transferability and relevance.

CONCLUSIONS

Navigating a project of this nature and planning for it is completely different. When reflecting on this initiative as an iteration of a much larger whole, it is important for all concerned parties to learn from experiences gained. These experiences are often tacit knowledge and taken for granted, failing to be incorporated in subsequent initiatives. This paper aims to articulate and share lessons learnt that are easily avoidable when anticipated.

It is very important for all individuals and teams that are involved in mobile learning projects to take cognisance of the relatively sensitive environment in education, where buy-in from educators would increase the success of the pilot and the possibility of sustainable future relationships.

Mobile technology projects seem to enhance all these considerations because of the personal nature of the technology as it is integrated in the cultural praxis to a larger degree. Technology is and can never be value free and as such, these values need to be articulated and agreed upon by all members of the project team. It is hoped that practitioners and project managers are able to transfer some of our findings to their own initiatives.

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