United Nations ECOSOC Innovation Fair

1. Name of the approach/ tool/project

Mobile Learning for Mathematics (Nokia MoMaths) project in South Africa and Finland

2. Description (methodology, techniques and strategies used);

In 2008, the South African President's office requested a project exploring the use of mobile technologies to support formal education in South Africa. Consequently, in 2009, Nokia, with the support of Nokia Siemens Networks (NSN), led a project team, including several government and private sector partners, in conceptualizing a pilot project which tested and measured the efficacy of using mobile technologies to support learning of Grade 10 mathematics in South African schools. This was referred to as the *Imfundo Yami/Yethu Project*. The focus of this research stage involved six South African high schools

Following the evaluation of this pilot, the project was extended to 30 public schools across three provinces in South Africa and the browser-based solution was further refined. *The Mobile Learning for Mathematics project* was led and funded by Nokia, again with the collaboration of various government and private sector stakeholders, from January to December, 2010. The potential reach for this was approximately 3,000 Grade 10 (16-year old) mathematics learners.
In 2011 the project is further expanded to reach approximately 150 schools in South Africa, targeting 18,000 learners. At the same time the Nokia MoMaths service is trialled in Finland. In this context, where mobile technology is ubiquitous amongst teens a higher-end solution was tested. This made use of Nokia's OVI-chat for the collaborative aspects of the service.

A mobile mathematics service has emerged from this process which provides learners and teachers access to interactive mathematics learning materials using a mobile delivery platform combined with a social media application for peer-to-peer support. In South Africa, materials are aligned to the current South African curriculum for Grade 10 mathematics. The Finnish students have been able to use most of this material for the Finnish curriculum. Learners can work through short theory sections, or answer questions from a database of approximately 10,000 questions, which are categorised by topic and degree of difficulty. Learners receive immediate feedback on multiple choice practice exercises, and can compare results with their classmates in their school, in other provinces, and nationally.

This has been done in a way that makes it possible for learners to use their own mobile telephones (where they personally own a suitable devise), to borrow a mobile phone from a friend or relative, or to use a mobi-kit phone as provided by their school.

The service is free for users. A unique IP address for the service allows the data costs to effectively be zero-rated for the end user, and the data costs can be paid in part, or in full, by a third party sponsor. To date, in South Africa, the data transfer costs have been paid for the participation mobile operators (MTN and Cell C), but in future this may be a shared cost between the mobile operators (who discount social services as part of the e-rate licensing

requirements), the government department offering the social service, and or a third party sponsor (such as a parent, individual or corporate sponsor, or school). In Finland the data transfer costs are also paid by operators (TeliaSonera, Elisa and DNA)

3. Implementation methodologies

The Mobile Learning for Maths project was conceptualised as a result of a request from the South African presidency. This lead to a public private collaboration lead by Nokia, involving the South African government (Meraka Institute, Department of Basic Education, Department of Science and Technology, Department of Communications, Presidency) and various private sector companies (Nokia, Nokia Siemens Network, MTN, Cell C, MXit, Maskew Miller Longman), for the design and implementation of the project.

A steering group, chaired by the South African presidency, was established to guide the project implementation and coordinate partner contributions. A local project team was established and led by Nokia which provided a global project manager as well as a local (South African) project coordinators. Maskew Miller Longman developed the Grade 10 mathematics content and this was re-versioned for both mobile and online access by Nokia. MTN and Cell C contributed the data transfer costs for traffic on the service. MXit provided the social networking delivery channel in South Africa. In Finland the collaborative elements were provided by Nokia OVI chat. Research, evaluation and monitoring services were funded by Nokia and provided by Neil Butcher and Associates. The Provincial departments of education in South Africa selected the schools to participate in the project, based on criteria developed through the pilot experience. The project team provided a one day teacher training session for the participating teachers and thereafter schools were supported through regular e-mail communication from the project manager and support from their provincial departmental officials.

4. What is innovative about this approach/tool/project;

There are several aspects of the project, which make it unique:

1. The project set out from the outset to pilot and research an intervention which could be taken to scale, with use by all grade 10 South African mathematics learners as its ultimate target. Most other technology enhanced learning interventions are piloted at a small scale, and then find it difficult to scale up the pilot offering. The evaluation research helped to ensure that the pilot was designed with this end goal constantly in sight.

2. The project set out to find a way to be affordable on a mass scale, with no charge to end users. Its focus from the outset was on finding a scalable and sustainable business model, which could have global relevance. The research supported this process, and resulted ultimately in a business and financial modelling tool which is being used by Nokia for its global expansion of this concept. The model allows for the country context data, and costing variables to altered to see the financial implications of key decisions relating to project implementation in new country contexts.

3. The innovation in terms of allocating a unique IP address for this social service, which meant that the data transfer could be subsidised or paid for in full by third parties (other than the end users) is a substantial contribution to m-learning.

4. The evaluation was formative and evaluation findings were reported as soon as possible to the Nokia project manager, and subsequently to the steering group so that these could be acted upon and result in changed in the project implementation.

Although the "almost ubiquitous" access to mobile devises for South Africa adults has been written about, and there has been much anticipation of the mobile devise as the "PC of Africa", little has been known about mobile penetration at schools, and amongst South African youth in different kinds of South African schools. This research highlighted the inequalities still prevalent in South African schools, showing that there is clearly no single model or "one size fits all" approach for supporting access to mobile devises. The mobi-kits used in this project – and owned by schools – are a step towards more equitable access to mobile devises in schools, and for youth. They are not without problems, and the research highlighted the need for different access models to be applied in different school contexts (socio economic contexts, as well as rural and urban contexts); the need to ensure school ownership of mobile devises, and the importance of timetabling for learners to have access to the devises, both during class, as well as outside of class time (breaks, mornings and afternoon sessions) for independent use by learners.

Nokia now has a global vision for a mobile mathematics service, which has drawn on the research and project experience in South Africa. The global vision is to facilitate a cutting edge mobile learning community for teens; while ensuring that commercial principals underpin all transactions; so that social investment can be sustained to support the global goal of 'Education for All'.

e-Learning services have been provided before in online environments, but the advantage that the mobile interface provides is that it:

- Lowers the cost of technology required to use such a service;[1]
- Requires minimal teacher training;
- Allows for use anytime and anywhere;
- Does not put additional pressure on computer infrastructure in schools; and
- Brings mathematics into the social networking space already used by youth.

5. Evidence of results and impact

The Nokia MoMaths has included a strong formative research and evaluation component, from its inception. Both qualitative and quantitative indicators of uptake, use and impact of the service have been documented in detail at each phase of the implementation, including the following reports:

- Roberts, N and Butcher, N (August 2009) *Evaluation of the Imfundo Yami/Yethu project,* Neil Butcher & Associates

[1] A mobile handset is much more affordable than a computer, and there are higher levels of personal ownership of mobile telephones than computers amongst learners and teachers.

- Roberts, N and Butcher N (April 2010) School data and uptake and usage for Nokia Mobile Maths project Janaury-March 2010, Neil Butcher and Associates
- Roberts, N and Butcher, N (August 2010) Evaluation of the Nokia Mobile Maths project January – June 2010, Neil Butcher and Associates
- Roberts, N and Butcher, N (March 2011) Evaluation of Nokia MoMaths 2010: Report on uptake use and impact on results January – December 2010, Neil Butcher and Associates

What follows is a short outline of some of the key findings from the research.

- South African schools are classified by socio economic status of the communities they serve. Quintile 5 is the most affluent, and Quintile 1 is most poor. During 2001, the uptake and use of the service was notably high amongst learners in Quintile 3 schools, and learner use continued through the school holidays and during the teachers strike.

- There were clear examples of learners using the service independently despite little or no use of it by their teachers. This provides insight into the extraordinary motivation and commitment to improve their lives through education, which exists amongst these young South Africans. Having a service which can reach more of these motivated young people, to improve their mathematics performance – which is not wholly dependent on a teacher- is a significant an contribution to South African mathematics education.

- There was positive feedback from the majority of teachers. Teachers cited improvements in learners' attitudes towards mathematics; reduction in their workload in terms of administration and marking of homework; and improvement in learner results.

- There was positive feedback from the majority of learners, who were grateful for the opportunities this provided. Learners liked the use of mobile technology and social media for mathematics.

- The biggest problem in the project – identified by both teachers and learners – was lack of access for some learners to a suitable mobile telephone.

- The uptake and use of the Nokia MoMaths service in South Africa, from January – December 2010, has been good:
  - 66% of the learners registered (which comprised 3958 Grade 10 mathematics learners in the 30 participating schools) visited the service.
  - 2136 learners were active users, completed at least one practice exercise or test on the service. This represents 54% of all the registered learners, and 82% of the learners who visited the service.
  - A core of 656 learners emerged that used the service regularly over the duration of 2010. They completed more than 16 exercises or tests on the service.
  - A smaller group of 121 learners emerged as extensive users, each completing more than 45 exercises and tests.
  - 10 learners, from five different schools, completed more than 1000 exercises tests, with the highest number of exercises and tests completed bring 3026.
  - Considering that the use of the service was voluntary and encouraged by some teachers (and not others), that a core of regular learners emerged, which

comprised 17% of the target, and 25% of the active learners, is a positive indication of the value of the Nokia MoMaths service.

- The impact that the Nokia MoMaths service on South African learner results in 2010 is also very positive. Although there is significant variation in uptake and use of the service by province, school, and individual learners, analysis of the selection of learners (1950 learners) for whom data was available on their final Grade 9 and final Grade 10 mathematics results showed that the MoMaths service had a positive impact on results.

- In a context where mathematics results tend to decline substantially from Grade 9 to Grade 10 in South African public schools, the learners who used the Nokia MoMaths service regularly (completing more than 15 practice exercises and tests) results for Grade 10 were 7% better on average than their peers (from the same selection of 30 schools) who did not use the service regularly.

- Analysis of their individual shifts in results from the Grade 9 baseline, to their final Grade 10 results also revealed the positive impact of regular use of the Nokia Maths service. On average learners who used the MoMaths service regular had a shift in results from Grade 9 to Grade 10 which was 6% less than the shift evident for the average learner who did not use the service regularly.

- The Nokia MoMaths service impacted most positively on learners who were failing mathematics in Grade 9 (obtaining code 2:26%-39%) and the learners obtaining distinctions in Grade 9 (code 7:80%-100%). These learners who used the service regularly saw the biggest difference in their average results for Grade 10 mathematics, and their average shift in their results from Grade 9 to Grade 10, when compared to their peers had the same codes for their Grade 9 mathematics results but who did not use the Nokia MoMaths service regularly.

6. Costs associated with the development and implementation of the activity

The pilot project in South Africa was funded by Nokia. Nokia Siemens Network and SAFIPA (South Africa Finland Knowledge Partnership Program). In-kind contributions were given by other partners.

7. Contact information

Riitta Vänskä,
Senior Manager, mobile and learning solution,
Nokia
Katajaharjuntie 5 a 11
Finland
+358 40 544 2276
Riitta.vanska@nokia.com

NOKIA