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## **Where books are few: the role of mobile phones in the developing world**

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### **Introduction – ultra-mobility and digital youth**

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For every personal computer in a developing country there are roughly four mobile phones. Although many of these are likely to be older or low-end models, today's high-end devices have the equivalent processing power of a personal computer from the mid-1990s. In comparison, personal computers in 2009 have more number-crunching ability than all the computers that took the Apollo rocket to the moon over 30 years earlier in 1969. The boundary between mobile phones, hand-held game consoles, entertainment devices and personal computers is becoming increasingly blurred, with devices such as the Blackberry, Symbian-driven smart phones, GPS-enabled mobile phones, Ultra Mobile PCs and Nokia's N-Gage breaking new ground. Technology continues to advance at a remarkable pace, opening up new opportunities few people would have considered a few years ago.

Mobility – and increasingly 'ultra mobility' – is the buzzword of the day. According to the chief executive of OQO, a manufacturer of ultra-mobile PCs, 'Ultra mobility is the ability to access all of your information, get in touch with anyone you want to, collaborate with anyone, and run any application you want from anywhere on the planet.'<sup>1</sup> Convergence is making this possible, with music players, Wi-Fi connectivity, video cameras, GPS units and live television capable of running on a single device, often a mobile phone. The days of carrying a separate phone, camera and music player are over. Indeed, many people are beginning to question use of the word *phone* at all, preferring to refer to these new gadgets as mobile communication devices, or digital assistants.

'M-learning' is a term regularly used to describe the many possibilities opened up by this convergence, whether they be getting exam results by mobile phone, lecture podcasting via iPod or structured language games on a Nintendo. These are still early days, and while examples of m-learning in action are continually on the rise, the benefits have already begun to be studied and documented. In *Mobile Technologies and Learning: a technology update and m-learning project summary*, Jill Attewell (Attewell, 2005) highlights several. According to her findings, m-learning is helping students to improve their literacy and numeracy skills, and to recognize their existing abilities. It also encourages both independent and collaborative learning experiences, and helps learners to identify areas where they need assistance and support. It can help to combat resistance to the use of ICT, which can help in bridging the gap between mobile phone literacy and ICT literacy, and help to remove some of the formality from the learning experience which engages reluctant learners. And it can help learners to remain more focused for longer periods.

Further studies are painting a picture of today's youth becoming increasingly comfortable and accepting of their new digital lifestyles, powered by always-on technology such as mobile phones, and enriched by portable entertainment devices such as iPods, digital cameras, Sony PSPs and the Nintendo Game Boy. Friendships are made, maintained and lost online, often in virtual worlds and on social networking sites such as MySpace, Facebook and Bebo. Much of what we are seeing today – generally out of the classroom but increasingly in it<sup>2</sup> – is technology driven, but this technology is not universally accessible.

### **Mobile access in the developing world**

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The living and learning environment in developing countries can often be quite different. Where mobile technology may prove a complementary extension to teaching methods in the West – improving or enriching the learning experience, for example – in many developing countries it offers the hope of revolutionizing learning altogether, even taking it into areas previously starved of reliable or regular education services. This is particularly true in rural areas, which may be characterized by a lack of fixed telephone lines, poor roads and unreliable electricity, poor postal services, few if any personal computers, few teachers and most likely no internet access.

What many of these communities will have, however, is mobile network coverage and, if not their own phones, at the very least access to one. Learning by distance is nothing new in many developing countries, and the mobile phone has the potential to unlock it yet further, expanding its reach and delivering richer, more appropriate, more engaging and interactive content.

But despite the promise, problems remain.

Imagine two mobile phone users. One lives in the Land of Plenty and owns an iPhone. He or she can access the internet via free wireless connections dotted around the city, download and play games, keep in contact with friends and family via instant messenger (IM), watch streaming video and live TV and use as much data, SMS or voice as s/he likes with a cheap, all-inclusive price plan. The other lives in the Land of Less. He or she uses a shared phone, lives in an area not covered by a data network of any kind, has a sporadic signal, a phone technically incapable of playing games or video, and has to think twice before sending an SMS or making a voice call because of constant concerns about airtime credit, not to mention worries over how the phone will be recharged if the mains electricity goes off and doesn't come back for days.

### **Closing the digital divide by mobile**

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During spring 2007, I was invited to the 16th International World Wide Web Conference in Banff, Canada. I was there to take part in two separate tracks, although the topic was the same – how the mobile phone might help to close the digital divide in the developing world. My talk on the first day was more general, discussing the delivery of targeted information: health messages, wildlife alerts or market prices, for example – via text message (SMS) – and the importance of understanding the complex cultural issues that surround technology adoption in places like Africa, a place where I have done most of my work. On the second day I sat on an Expert Panel discussing something a little more specific: access to the internet via mobile devices under the same developing country conditions.

I started my Panel discussion with a short description of what I considered Utopia, the ideal conditions under which we'd all like to be working. It went something like this:

Everybody, everywhere, wirelessly communicating and accessing a whole range of personally relevant information whenever they like using a wide variety of compatible devices at high speed and low cost.

This, of course, isn't realistic *anywhere*, let alone in many developing countries, at least not yet. But the specific problems of web delivery in these places are not dissimilar to those faced by anyone looking to work with mobile technologies in the developing world. And, as you would expect, the m-learning community is not exempt. Ageing handsets, limited functionality, lack of bandwidth, issues of literacy and cost are just some of the barriers, and there are many. It is these barriers that I propose to discuss a little later in this chapter.

But for now let's imagine, for one moment, that we *are* living in Utopia and almost anything is possible. The sky's the limit! What would that look like? Given a high-end mobile device – mobile phone, personal digital assistant (PDA), pocket PC, even things like iPods – what could we do? More to the point, what would *students* require it to do to make their learning experience more engaging, enjoyable and productive, assuming that these are key objectives? Would their mobile learning experience be largely based on video lectures? Collaboration with other students via online blogs and wikis? Playing games and 'learning by doing'? Schooling in a virtual world with virtual classmates, teachers and desks? Pitting students against one another through online spelling and maths competitions? Mobile-delivered examinations? All of these? More?

### **Online learning made mobile**

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Some of these things, of course, are already happening. The University of California in Berkeley recently began posting entire lectures on YouTube<sup>3</sup> and, of course, YouTube content is accessible via mobile devices. A lecturer at Bradford University in the UK early in 2008 went as far as abolishing traditional lectures altogether in favour of podcasts,<sup>4</sup> in his words 'freeing up more time for smaller group teaching'. And children can learn to count, spell or even play guitar using Java-based mobile games, downloadable from the internet or directly onto their phones via a carrier portal.

The closer you are, of course, to the optimum device and network conditions the more things become possible. Three projects highlighted

below take advantage of some of these optimum conditions, but use the technology in slightly different ways and aim at subtly different target audiences. The first, wildlive!, sets out to raise awareness of wildlife conservation among the wider general public, whoever and wherever they may be. The second, Freedom HIV/AIDS, was more specific, targeting members of the public particularly at risk from contracting the disease, largely in developing countries. And the third, Dunia Moja, is a lecture and class-based education tool aimed at a controlled group of students taking a particular university course.

### wildlive!

As 2002 came to a close, a visionary team at Fauna & Flora International – a Cambridge (UK) based conservation organization – began looking at ways in which emerging mobile technology could be used to promote their international conservation effort. A new breed of handset was coming onto the market, with colour screens, internet access, video capability, cameras and the ability to play games. wildlive!<sup>5</sup> was launched in the UK in 2003 and then across Europe in 2004, and adopted a combined web and WAP (Wireless Application Protocol) approach, meaning that it provided conservation content on the internet *and* mobile phones. News, diaries, discussions and other information were added to the website, which was then in turn rendered for mobile devices accessing via the Vodafone network. A ‘community of interest’ was created, allowing users to contact others with similar ideas and views, and a wide range of conservation-based resources and downloads were made available online. Among this innovative range of content were five mobile games which taught users about gorilla, turtle and tiger conservation while they roamed around a range of environments. Another game was a 500-question quiz based on zoology and biology. The project received considerable attention, was nominated for an award and is still seen as groundbreaking today.

### Freedom HIV/AIDS

Originally developed for the Indian market, Freedom HIV/AIDS<sup>6</sup> was launched on World AIDS day 2005 and sought to use mobile phones to take HIV/AIDS education to the masses. A number of games were developed, including ‘Penalty Shootout’ and ‘Mission Messenger’. In the

shootout game, the player is given points for saving penalties and receives tips on how to avoid HIV/AIDS transmission. At the same time the game seeks to dispel myths surrounding the disease. In the second game, the player 'flies' across the African continent distributing red ribbons and condoms, spreading messages of HIV/AIDS awareness, prevention, transmission and safety. The games were originally developed for the Indian market but have since been translated into a number of African languages.

### **Dunia Moja**

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Dunia Moja,<sup>7</sup> Swahili for 'one earth', seeks to use 'mobile technologies to connect international students and faculty to stimulate learning and debate in environmental sciences'. This innovative project, piloted in 2007, was a collaboration between Stanford University and three African academic institutions – the University of the Western Cape in South Africa, Mweka College of African Wildlife Management in Tanzania and Makerere University in Uganda. The project used high-end PDAs to allow students to download and watch video lectures from academic staff in each of the partner universities, and to contribute to the discussion and debate through mobile blogging to a central website. The course was centred around global environmental issues and their impact on the African continent and the United States, and brought local perspectives and viewpoints to bear on the course topics. Faculty and students from the four participating institutions electronically shared course materials, exchanged information and contributed their own course content. In m-learning in developing-country terms, Dunia Moja is a pioneering first.

As these three interventions show – and there are many more out there – much is possible if you have higher-end devices and a fast, reliable data network at your disposal. In the Land of Plenty the sky really is the limit. In the Land of Less, however, we have fewer choices.

### **M-learning constraints for the developing world**

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Furthering the advance of m-learning in developing countries is governed by a combination of five key constraints, four of which are technical. There are other non-technical ones such as literacy, culture and language not covered here. Depending on the target area, none or all of these may apply. I consider these technical issues to be as follows.

## Mobile ownership

Although growing at a phenomenal rate, mobile ownership in many developing countries is still relatively low, and nowhere close to the near-100% penetration rates that we see in many mature markets. If educational establishments begin to embrace mobile technology to any significant extent, then issues of ownership and access to handsets by students need to be addressed to ensure that, in the words of a recent American President, ‘no child is left behind’. Putting learning tools in the hands of children in developing countries is a key objective of the One Laptop per Child (OLPC) project, run by MIT Media Lab, Cambridge, MA. Many people believe that the mobile phone would be a better tool to work with. The debate continues.

## Mobile technology

Where pupils do own or have access to mobile phones, more often than not – and this is particularly the case in many rural areas – these phones will more likely be either older model, or lower-end handsets with limited functionality. In order to develop appropriate teaching tools, the reality of the target market needs to be considered. Ownership and use of PDAs and pocket PCs should most likely be considered non-existent among the wider community.

## Network access

Higher-end handsets with data capability are only useful in areas where the mobile network can service them, and where costs of data access are not prohibitive. In many cases neither of these is a safe bet. By way of example, during a recent month-long visit to Uganda working with Grameen, for approximately 90% of the time I was unable to connect to the internet using my phone.

## Device limitations and lack of industry standards

Mobile phones may be ubiquitous, highly portable, shareable, immediate and always on, but there are also limitations which present challenges to even the most talented mobile applications developers – small (and generally low-resolution) displays, awkward text input methods, slow data

access (if at all) and issues of battery life, among others. On top of all that, the mobile industry has historically suffered from a lack of standards – different manufacturers supporting differing video and audio formats, no standard screen size and resolution, lack of regular support for Java and/or Flash, incompatible browsers (if at all) and a wide array of memory sizes. All of this makes the platform landscape fragmented enough to make developing an m-learning application a real challenge.

Despite these issues, however, there is still much that can be done. Text messaging, or SMS, is universally available to mobile owners the world over, and is relatively cheap, direct, and gets around many issues of literacy. A number of African countries allow students to obtain their exam results by SMS, or to check whether they have successfully enrolled on a course – although these examples are based more in the administrative side of education.

### **M-learning technology in the developing world**

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In 2005 the University of Cape Town trialled the use of mobile phones to help administer a number of its courses.<sup>8</sup> Text messages were sent out to students whenever rescheduling and cancelling of classes was necessary, whenever there were computer network problems, and when test results became available. According to a spokesperson at the university, ‘At a superficial glance, with its concentration on administrative functions, the project does not seem remarkable, particularly as the developed world moves into sophisticated mLearning. The importance of the project, however, is that it illustrates a set of principles useful for the introduction of this technology into the third-world environment, or into any institution making first steps into mLearning.’

In other African countries SMS is being used to alert parents if their children haven’t turned up for school, or by children who find themselves the victims of bullying. During an online discussion towards the end of 2007 about the potential of mobile technology in e-learning, a number of initiatives were discussed, including the texting of homework to students, or the ability for students to text in their homework answers and for SMS to be used as a reading aid. With some children living far away from their nearest school, such initiatives could be revolutionary. And with products such as FrontlineSMS,<sup>9</sup> implementing such projects need not be expensive or technically out of reach. Today it is more about ‘blue

sky thinking' than about the sky being the limit. But it will not always be this way.

## Conclusion

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Ironically, technological conditions aside, m-learning is particularly well suited for use in developing countries. M-learning is useful as an alternative to books or computers, something generally in short supply. It is empowering in situations where students are geographically dispersed, again a common scenario, and is particularly helpful in getting students up to speed who may have previously felt excluded, or who find themselves behind and needing to quickly catch up.

Mobile technology has revolutionized many aspects of life in the developing world. The number of mobile connections has almost universally overtaken the number of fixed lines in most developing countries in the blink of an eye. If further evidence were needed, recent research by the London Business School found that mobile penetration has a strong impact on GDP. For many people, their first-ever telephone call will have been on a mobile device. Perhaps, in the not-too-distant future, their first geography lesson will be on a mobile, too.

## Notes

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<http://news.bbc.co.uk/1/hi/technology/7178278.stm>
- 2 Doug Belshaw's teaching-related blog,  
<http://teaching.mrbelshaw.co.uk/index.php/2006/09/21/20-ideas-getting-students-to-use-their-mobile-phones-as-learning-tools/>
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- 8 [www.usabilitynews.com/news/article2572.asp](http://www.usabilitynews.com/news/article2572.asp)  
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