MOBILE TECHNOLOGIES AND THE FUTURE OF GLOBAL EDUCATION

Rory McGreal
Athabasca University, Athabasca, Canada
rory@athabascau.ca

Optimism for the future lies on the diminishing "cost" of the production and dissemination of knowledge. This must be differentiated from the "price". The cost reductions are based on the increased power of technology and the expansion of the possibilities of human thought due to digital technologies and telecommunications. The fact that the price is not being reduced and is sometimes in fact going up in spite of the cost reductions is a political/economic problem that must be resolved. This is not easy as the prices are all too often subject to control by monopolies or global consortia or even artificially kept high by governments. It is a sad fact that even as average incomes are rising due to productivity gains, the median incomes are dropping. This is having a particularly negative effect on developing countries, but is also apparent in much of the developed world.

The major technological trends supporting the view that "equal" or "free" education is becoming possible are those involving the new mobile devices: digital divergence – the growth in popularity of dedicated wireless devices for transmitting information; combined with digital convergence – the growth of all purpose devices where the cell phone is no longer just for speaking, but also for text messaging, photography, radio, even digital TV, web browsing, etc. So, the possibility is there to vastly increase access to learning, but that does not mean that this will happen automatically. There are many obstacles. These aspects have been critically examined in this paper.

Five laws

Significant trends or "laws" in telecommunications and computers are also driving down costs. The first is Gilder's Law, where George Gilder has noted that the costs of telecommunications are dropping drastically with digitalisation. The costs of high bandwidth Internet connections and long distance telephone calls are on a consistent downward trend, with no end in sight and at a rate three times faster than the drop in the costs of computers (Gilder, 1990). Unfortunately, for some although the costs are going down for the Telcos, the prices are not. With growing competition from all sides, the downward trend in prices will prevail.

The second, Moore's law notes the accelerating reduction in the cost of computing power. The computer you bought last year will have half the power of today's computer at the same price point. More specifically, Moore's Law states the number of transistors on a chip doubles every 18 months (Webopedia, 1998). As a result, the cost-performance rises as the square of the number of transistors. Electronic game companies are leading the way in the development of inexpensive high powered computers. Okamato, a vice president of Sony, the company that makes the Playstation and PSP, said "Moore's Law is too slow for us," noting that his company is not willing to wait 20 years to achieve a 1000-fold increase in PlayStation performance (Kosak, 2002).

At the same time that computing prices are falling, the price of paper is continuing to rise. If the cost of computing power continues to drop at the present rate as predicted, this year's computing power, in ten years, will be available on a sheet of paper. And the main cost will be the paper.

Third, Metcalfe's Law states that the value of a network increases as the square of the number of users. For example, one fax machine is worthless, with two it becomes useful and it becomes more useful as you add more fax machines to a network. When the majority of businesses have a fax machine, it becomes indispensable (Wikipedia, n. d.-a).

For education, face-to-face classroom-based courses have tended to be more interactive. Correspondence education required self-study skills and discipline, while the large televised courses incorporated few opportunities for interaction. Now, with the power of networks, large scale classes can incorporate real interactions, including group learning, simulating the small class experience.

A fourth "law" predicts even greater exponential power for networks: Reed's Law of Group Forming Networks (Reed, n.d.) (or Seeley Brown's Community Law) (Brown & Duguid, 2000). This law states that the value of a learning network also increases as 2 to the power of the number of learners connected to it. From peer to peer networking to learning communities, contrary to accepted wisdom, the learning opportunities increase with larger groups. For example Java programmers belong to Java users groups online, where they help each other learn and develop their programming skills. The larger the group, the more useful it becomes.

Fifth, Kurzweil's Law of Accelerating Returns goes further and posits that these exponential changes are themselves changing exponentially, claiming that technology will progress by 20 000 years (at the present rate) in the 21st century. Network and computer power along with cost-effectiveness will drive this exponential growth in the rate of exponential growth (Kurzweil, 2001).

Trends in education

There is a growing trend to evaluate learners achievement by outcomes. Now that the students have finished this course or that programme, what can they do? This also pertains to our institutions, which are presently evaluated on their inputs such as the number of PhDs on faculty, the number of books in their library, etc. Industry is more interested in whether or not graduates can write a paragraph, or interpret a graph etc. They have less interest in how this was accomplished.

Mass customisation of courses is now possible providing individualised learning opportunities to large number of students. Training companies like SkillSoft serve large number of students around the world (Skillsoft Home Page, 2005). When asked what the student/teacher ratio was, a spokesman replied: "One-to-one." When students need it, they get personal attention from a tutor. This is only possible with the power of networks.

Peer teaching is also a growing trend, especially as part of the growing importance of informal learning, where people with specific interests get together online and help each other learn (Goldwasser, 2001). If one were to look at a learning continuum one might determine an order where the optimum means of learning would be by "doing", that is by actually being involved in performing the skill to be learned. One could argue that having once learned a skill, it can be reinforced and enhanced with practice, and improved even further through teaching it to others. Especially if you are performing the skill while you are teaching it. In this way you are focused on doing it right and paying attention to the manner in which the skill is performed.

The digital divide of computer haves and have nots is rapidly diminishing in the developed countries as more and more families purchase home computers and others have access through libraries, cybercafés, computer laboratories, and community access centres. In the developing word, the growth of access to wireless telephony using mobile phones is a significant development. The next generation of inexpensive Smart phones will do much to break down barriers.

Learning objects are standardised interchangeable components for learning. At present, a wide range of different institutions are creating similar content and reinventing the wheel. We no doubt, need to have a dozen or some might argue a hundred lessons teaching the same concept, for example: the application of a lever. But do we need thousands? With learning objects course developers should be able to "engineer" courses by assembling components and using their expertise, assemble them into a quality course. With the new developing international standards for the exchange of learning objects, the cost-effective assembly of quality courses will become a reality, opening the way for the free exchange of learning content (McGreal, 2004).

The growth of the Open Source/Open Archive initiatives will ensure that learners, regardless of cost will have access to a wide range of software applications and learning content. Open source learning management systems like Moodle and Sakai are reducing the costs of delivering courses online to large numbers of students (Moodle Home Page, 2005; Sakai Home Page, 2005).

Jimmy Wales, one of the founders of Wikipedia the free online encyclopedia claims "It is my intention to get a copy of Wikipedia to every single person on the planet in their own language. It is my intention that free textbooks from our wikibooks project will be used to revolutionise education in developing countries by radically cutting the cost of content" (Wikipedia, n. d.-b).

Global competition has arrived. In education, it is in its infancy. Most students who study online do so from a local institution. On the other hand, private US companies like Phoenix University or the Devries Institute educate hundreds of thousands of learners in the US and overseas.

Philanthropists, advertisers and sponsors will find it opportune to support the development and delivery of online lessons and courses. Philanthropists will find that their donations will have a lasting beneficial effect on the learners supported. Advertisers will find that associating their names with learning will pay dividends.

Mobile devices

Distance education is on the brink of another shift. Mlearning or education on the go – thanks to mobile phones and personal digital assistants (PDAs), expands the boundaries of anytime, anywhere learning. However, as it is an emerging field and the potential of Mlearning is still untapped and best-practice guidelines for Mlearning are still unwritten (Keegan, 2002). Mlearning can be seen as the next stage in the development of online learning. Mlearning, or learning made accessible through PDA's, mobile phones, ultra notebooks, or other portable wireless devices, maximises the idea of anytime, anywhere learning.

To date, some research from a student's perspective has explored which mobile technologies are the best to employ (Bull & Reid, 2003; Rieger & Gay, n.d.; White, 2004) or what applications enable an effective learning community (Fox, 2005) and what support systems need to be in place for Mlearning (Laroussi, n. d.). Further work from a teachers perspective has shown that Mteaching can also be efficiently conducted using mobile devices (British Educational Communications Technology Agency, 2004).

In the first quarter of 2005 there were already more than one billion "data-enabled" mobile devices in use worldwide and this number is growing exponentially (ABI Research, 2005).This abundance of wireless and mobile technology has the potential to increase flexibility for distance learners. For example, not only can they access electronic versions of course materials from their personal computers as they are currently able for many courses through the Athabasca University website, but they can now download selected course materials to PDA's, mobile phones, ultra computers and other mobile devices for review. Whether learners are on a bus, at a child's football match or on their lunch break; mobile technology increases the boundaries of anytime, anywhere learning.

It was approximately ten years ago that distance education experienced a shift in course delivery methods. Open universities and continuing education departments of dual-mode institutions both have embraced the World Wide Web. As internet access increased, they began moving from mailing course content such as books, audio or video tapes, or photocopies of journal articles, to creating or linking to digital content which could be read on line. Students could access course materials from wherever they were, 24 hours a day without the help of a librarian.

At the same time, the technological capacity of small mobile devices has increased dramatically. Screens are bigger and better; systems have more memory; they have more multimedia capabilities;

and there are more refined methods for inputting data (Wagner, 2005). There have been constant advancements in this field creating a plethora of possibilities, such as smart phones and PDA models with unique capabilities, and a wide variety of systems and applications. According to (Clyde, 2004), the challenge "is to identify the forms of education and training for which Mlearning is particularly appropriate, the potential students who most need it and the best strategies for delivering mobile education" (p. 46). However, these mobile devices have disadvantages as well: small screens, small keyboards if they have them at all, forcing students to learn new ways of note-taking, communicating, sharing, creating and producing information.

Mobile technologies illustrate the convergence of the two types of distance education technologies (Hulsmann, 2004). Type I (information media) media such as described earlier carries the distance education content, not only in text but in many multimedia formats as well (audio, video, graphic). Type C (Communication media) include multimedia interactivity options supported by mobile technologies to allow for interaction between and amongst learners, teachers and community members using a variety of modes (audio, text and video conferencing). Together and converged, these types of media allow for the emergence of type S (social) applications that allow learners to become aquainted, work collaboratively, schedule learning and in otherways enhance learning. So, in addition to increasing accessibility, mobile devices have the potential to increase connections between students, tutors, and instructors and decrease isolation.

Convergence and divergence of mobile devices are both happening simultaneously. Mobile phones are convergins as smart phones with PDA features (e. g. Nokia 9290 Communicator and the Erickson 218 Palmtop), PDAs are converging with telephone capabilities (e.g. Treo and Blackberry). Others are adding features such as video, photos, audio, and gameplayers. Divergence is demonstrated with e-books (e. g. Rocketbook and Softbook) or with specialized devices (e. g. 3d glasses and smart shoes).

Electronic game audio devices such as the PSP, Gizmondo, and IPod are very powerful and relatively inexpensive computers. These can be hacked and used for educational purposes, other than educational gaming. At Athabasca University, researchers are facilitating access to library resources using gaming devices and other handhelds (McGreal, 2004).

Summary

So it seems that free education is possible. The changes described in this paper point to making free education a real possibility. With the growth of the World Wide Web, open access to learning opportunities, new international standards for interoperability, open source and open archive initiatives, along with the potential effects of the five laws, learning can be made available globally to anyone who can access the Internet.

The major technological trends supporting free education are those involving the new mobile devices: digital divergence - the growth in popularity of dedicated wireless devices for transmitting information; combined with digital convergence - the growth of all purpose devices where the cell phone is no longer just for speaking, but also for text messaging, photography, radio, even digital TV, web browsing etc. using mobile phones, personal digital assistants, handheld computers, e-books and other devices. Tavenas of Laval university warns "Change is mandatory, survival is an option. Make the right choice" (Tavenas, 2003). More optimistically, Danny Hillis commented "Let's put all this hype about change and transformation in perspective. It's underhyped. . . . There's something coming after us, and I imagine it is something wonderful" (Hillis, 1998).

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