

Effective Distance Learning in Developing Countries Using Mobile and Multimedia Technology

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Abstract

Although the developments of multimedia technology and internet networks have contributed to immense improvements in the standard of learning as well as distance learning in developed world, the developing world is still not in position to take advantage of these improvements because of limited spread of these technologies, lack of proper management and infrastructure problems. Unless we succeed in solving these problems to enable people of developing countries to take advantages of these technologies for distance learning the vast majority of the world population will be lagging behind. In this paper we take stock of the current situation and suggest some future directions in the resolution of these problems. We recommend the use of mobile and multimedia technology to reach this vast population of under-developed countries to impart quality learning in an effective way.

Keywords: Distance learning, multimedia technology, developing countries

1. Introduction

The concepts of distance learning are prevalent in developing countries for last few decades and it is very much in vogue in developed countries [1],[7]. In developing countries it started like many other countries did with correspondence courses where printed learning materials used to be despatched to the students at regular intervals and students were expected to read the materials and answer questions. The basic philosophy was teachers would be physically away from the students and have to conduct the teaching process from distance [2].

With the development of computer industry and internet networks during the last three decades things have changed and global communication has reached an unprecedented height [1]. With these developments immense scopes have come to the surface to impart learning in a much more efficient and interactive way. Multimedia technology and internet networks have changed the whole philosophy of learning and distance learning and provided us with the opportunity for close interaction between teachers and learners with improved standard of learning materials compared to what was existing only with the printed media. It has gone to such an extent to create a virtual class room where teachers and students are scattered all over the world. Although some of these facilities are expensive still the developed world is in a position to take advantage of these facilities to impart much better distance-learning to students residing in the developed countries. But for developing countries the story is different as computerization and network connections are still very limited compared to the developed world. In this paper we focus our attention on defining the problems of using these technologies for much more improved and extensive distance-learning and suggest how we could possibly reach these vast

majority of people from the developing countries with the improved quality of distance-learning provided by multimedia and internet networks.

Section one gives an introduction of the area. Section two presents the problems in developing countries to make use of these technologies. Section three presents statistical data to show the status of internet usage in developing and developed countries. Section four suggests future directions of research to solve these problems. We put our concluding remarks in section five.

2. Analyses of Works Done

In a distance learning, institutional implementation, administrative and organizational resources will have a heavier role than other elements such as individual course design techniques. In an individual delivery unit, instead, course design and management techniques will have a key role [1].

The open-universities which started functioning by late sixties and early seventies of last century, reaching off-campus students delivering instruction through radio, television, recorded audio-tapes and correspondence tutoring. Several universities particularly in developing countries still use educational radio as the main instructional delivery tool [1].

With the extended application of information technologies (IT), the conventional education system has crossed physical boundaries to reach the un-reached through a virtual education system. In the distant mode of education, students get the opportunity for education through self-learning methods with the use of technology-mediated techniques. Efforts are being made to promote distance education in the remotest regions of developing countries through institutional collaborations and adaptive use of collaborative learning systems [2].

Initially, computers with multimedia facilities can be delivered to regional resource centers and media rooms can be established in those centers to be used as multimedia labs. Running those labs would necessitate involvement of two or three IT personnel in each centre. To implement and ascertain the necessity, importance, effectiveness, demand and efficiency, an initial questionnaire can be developed. Distributing periodical surveys among the learners would reflect the effectiveness of the project for necessary fine-tuning. After complete installation and operation of a few pilot tests in specific regions, the whole country can be brought under a common network through these regional centers [2].

The sad reality is that the participation of many developing countries in the global information society remains insignificant. This is attributable to many causes, including perceived incompatibilities between cultures and technologies, an idealistic preference for self-reliance, and simple lack of economic or human resources to acquire and utilize the technology [3].

In developed economies, newer versions of technology are often used to upgrade older versions, but in developing economies where still older versions of technology are often prevalent (if they exist at all), the opportunities for leapfrogging over the successive generations of technology to the most recent version are that much greater [3].

The invisibility of the developing countries owes much to the lack of telecommunications infrastructure, though satellite services have the potential to change

that. In 1995, just four (of 55) African countries had an Internet presence. By October 1998, all but four countries had Internet connections of 64kbps or faster, Eritrea, the Congo, Libya and Somalia relying on dial-up connections. Many of these links were via INTELSAT, which owns and operates a global communications satellite system providing voice/data, Internet and video services to over 200 countries and territories [9].

In the conventional view, (i.e. as seen by technology developers and donors), developing countries passively adopt technology as standard products which have been developed in industrialized countries and which can be usefully employed immediately. However, successful use of IT requires much more than mere installation and application of systematized knowledge. It also requires the application of implied knowledge regarding the organization and management of the technology and its application to the contextual environment in which it is to be used. This implied IT knowledge often represents experience with the deployment of previous technology accumulated over time, such experiences contributing towards the shaping of new technology [3].

In addition to purely technological issues, the development of appropriate human resources skills are required, i.e. extensive training of the people who are going to use (and train others how to use) the resources. Training is seen as particularly important as this is not technology just a few people to benefit from, but for many. As Pekka Tarjanne, Secretary General of the ITU, made clear at Africa Telecom '98, "communication is a basic human right" (original emphasis). Nelson Mandela, at Telecom 95 in Geneva, urged regional co-operation in Africa, emphasizing the importance of a massive investment in education and skills transfer, thereby ensuring that developing countries also have the opportunity to participate in the information revolution and the "global communications marketplace"[3].

In the 1990s, Egypt's Information and Decision Support Center (IDSC), started a series of projects to support the establishment of Egypt's Information Highway. The project involved diffusion of decision making based on databases developed, maintained and directed by the Governorates [10]. The PC-based systems staff and developers were predominantly women from the local areas. It has been generally observed, however, that such developments may cause friction in the local communities, where the role of women may be downplayed by more fundamentalist groups.

The stated intention of Malaysia, as articulated by the former Prime Minister, Dr Mahathir Mohamad, is to become a "fully-developed, matured and knowledge-rich society by 2020". To this end, it has embarked on the Multimedia Super Corridor (MSC) project. Malaysia plans to leapfrog into the 21st century and the Information Age with an intellectual and strategic leadership, smart cities and smart lifestyles. To achieve this vision, however, growth at 7% per annum is required. In the present economic situation, this growth rate is unrealistic, though the government sees the MSC as a key stimulator of growth for the future.

Canada's International Development Research Centre (IDRC) runs a number of developing country projects that involve technology leapfrogging. The Pan Asian Network (PAN) was set up to fund ICT infrastructure and research projects in developing countries across Asia. Individuals, development institutions, and other organizations should all be able to use the infrastructure so as to share information [3].

PAN works with Bangladesh's world famous grassroots Grameen Bank. One service here is a "telecottage", where network services can be obtained. The technology and the material will be tailored to meet the needs of Grameen's typically poorly educated clients.

One of PAN's objectives is gender equity. Women, who constitute some 95% of Grameen's borrowers, will be prominent among PAN users in Bangladesh [3].

PAN is also responsible for linking Laos to the Internet. The Science, Technology and Environment Organization (STENO) of the Lao Government invited some Laotian IT professionals living and working overseas to return home and share their experiences with their colleagues in the country. STENO collaborated with PAN in designing an 18-month long project to build the necessary infrastructure for a dial-up e-mail service. Among the pioneer users were "researchers working on agriculture and aquaculture projects; journalists managing national news agencies and newspapers; lawyers consulting on international legal issues; travel agents planning business trips; computer resellers tracking down suppliers and obtaining pricing information; and about 20 others in both the public and private sectors" [11].

Enns and Huff (1999) describe the development of Mongolian telecommunications networks from a historical perspective, focusing on the country's first ISP (Datacom) sponsored by IDRC's PAN. Mongolia's infrastructure was deteriorating when the project was initiated, with a tightly controlled media and a one-party political system that effectively isolated the country. However, Mongolia's complex transition to a market economy and its requirement for information resources provided project planners with the opportunity to study technical challenges that would be common in other countries with similar backgrounds. Sierranet is a telephone-based computer network, funded by IDRC and created by university students in Sierra Leone to support research. Two functional e-mail networks – for the university community and for health professionals – were established. Although most users have fled the country in the wake of current military activity, the network environment is reported to be still intact. Once the carnage in Sierra Leone has passed, it is hoped that Sierranet will play a role in the reconstruction of the country and the restoration of Democracy [12].

The Navrongo Health Research Centre (NHRC) in Ghana is part of an international initiative funded by IDRC and other aid agencies called HealthNet. The system uses low-earth-orbit satellites and telephone-based computer networks for the exchange and transfer of health-related information in the developing world. NHRC started in 1988 as a field site for Vitamin A studies. Within ten years, it had become a world-class health research facility. It leads the way in applying epidemiological methodologies and is a forerunner in the adoption of new ICTs. The NHRC exerts an influence on Ghanaian and WHO intervention programs and policies, training researchers from Asian and African countries, attracting expatriate Ghanaian scientists to work in Ghana. Most significantly, the research undertaken at NHRC has resulted in dramatic reductions in child morbidity and mortality, as well as significant national improvements in standards of health care [3].

Over about the last ten years 'conventional' e-learning has been exemplified technologically by the rise of virtual learning environments (VLEs), such as WebCT and Blackboard, and the demise of computer-assisted learning 'packages', by expectations of ever increasing multi-media interactivity, power, speed, capacity, functionality and bandwidth in networked PC platforms. Pedagogically, we have seen the rise of social constructivist models of learning over previous behaviorist ones. All this is however only really true for Europe, North America and East Asia. In sub-Saharan Africa the term 'mobile learning' is recognized but as something grafted onto a tradition of open and distance learning and onto different pedagogic traditions, ones that have concentrated on didactic approaches rather than discursive ones. Mobile learning in these parts of the world is a reaction to different challenges and different limitations – usually those of infrastructure, poverty, distance or sparsity [4].

3. Experimental Evidences

In the developed world, Cunningham et al. (2000) referred in their report that “notwithstanding the rapid growth of online delivery among the traditional and new provisions of higher education, there is as yet little evidence of successful, established virtual institutions.” However, in a 2002 survey of 75 randomly chosen colleges providing distance learning programs, results revealed an astounding growth rate of 41% per program in the higher education distance learning (Primary Research Group, 2002). Gunawardena and McIsaac (2003), in their *Handbook of Distance Education*, has inferred from the same research case that, “In this time of shrinking budgets, distance learning programs are reporting 41% average annual enrollment growth. Thirty percent of the programs are being developed to meet the needs of professional continuing education for adults. Twenty-four percent of distance students have high-speed bandwidth at home. These developments signal a drastic redirection of traditional distance education.” According to an estimate, IT-based education and the e-learning market across the globe is projected at \$11.4 billion (United States dollars) in 2003 [2].

In the developing world, studies show only a tiny percentage of Africans enjoy Internet connectivity (Amoako, 1998), perhaps one in ten thousand outside South Africa. These people are effectively invisible in an electronic world. As Roche and Blaine (1997) have observed, if one measures the IT capacity of countries in terms of millions of instructions per second (MIPS), then it has been estimated that most of the developing world suffers from a “MIPS gap ratio” in the order of something like 1:26 with the developed world. Another estimate of the disparity suggests that developing countries, whilst representing around 80 percent of the world population, account for only 2 percent of the total global expenditure on informatics (Hanna, 1991) [3].

The major challenges are related to lack of time and to the unstable infrastructure, causing some of the registered students to drop out without completing the course. The lack of infrastructure and access to modern technology is often argued against the strategy for offering higher education to target groups in developing countries through internet. Statistics now show, however, that the situation is changing drastically. From data collected in around 2008 show in Africa internet usage is 4.7% of the population, in Asia it is 12.4%, in Middle East 17.4% and in Latin Am/Carib it is 20.5% of the population [14].

4. Suggested Future Directions of Research

In Section 2, we presented various efforts made to make distance learning effective in developing countries. Presentation of course materials through multimedia in remote locations where in villages there could be school structures where those presentations could be made is feasible. Of course learning materials must be self-explanatory and not boring. Using multimedia facilities like videos, audios, graphics and interesting textual descriptions, it is possible to reach the remote locations of the world where computer technology has not reached yet. As the areas not covered by computer and internet technology is still profoundly vast in the world this approach seems to be very constructive and should be pursued.

Wherever possible distance learning through multimedia should be imparted through internet as internet and networks are the vehicles of multimedia. But since bandwidth connection is still very limited in vast areas of Asia, Africa and Latin America it would still take long time to reach major part of the population of the above-mentioned regions with multimedia and web.

Mobile technology offers a very hopeful way to reach the vast population of the developing countries as it does not require bandwidth connections. We have to develop distance learning using multimedia through mobile technology. This seems to be the most viable way to reach billions living in the rural areas of the developing countries. Hence considerable research efforts must be dedicated to this line. The author plans to work on how to use mobile technology to provide distance learning in both developed and developing countries in an efficient way using advanced multimedia tools.

Some issues had been notified from research into the current state of play in Europe:

1. There is a wide range of roles for mobile technologies supporting the learner in many ways ranging from relatively simple use of SMS texting to the more advanced use of smartphones for content delivery, project work, searching for information and assessment. Some proponents of mobile

learning believe that it will only 'come of age' when whole courses can be studied, assessed and learners accredited through mobile devices. We do not subscribe to this view.

2. Although books are now being downloaded onto mobile devices, the authors believe that to support the learning process a great deal of thought has to be given to the structure of the learning and assessment material. However, it is true that for some, mainly at higher education level, mobile phones offer the opportunity to access institutional learning management systems. This provides greater flexibility to the learner without any new pedagogical input.

3. Costs are coming down rapidly; new first generation simple mobile phones will not be available on the market from 2010. All mobile phone users in Europe will be using 3 or 4G phones within the next two years. A welcome associated step is a move towards some form of standardization by the mobile phone companies as exemplified by the shift to common charging devices over the next two years.

4. The value which is put on possession of a mobile phone, especially by young people is surprising and the data on ownership suggests that this will be a ubiquitous tool for all very shortly and that it will be well cared for: there is evidence that ownership of devices brings responsible use and care.

5. Large scale educational usage in schools currently depends on government investment but in higher and further education it is safe to assume that all learners will have their own devices. Institutions will need to advise potential students on the range of devices most suitable for the curriculum, as they do currently with regard to computers. The convergence between small lap tops and handheld devices will continue until they are regarded as different varieties of the same species of technology.

6. There is a great potential for educational providers to work with large phone companies, both to reduce costs and to co-develop appropriate software [15].

Bangladesh Open University (BOU) is the only national institution in Bangladesh which is catering

distance education in the country. It has extensive network through out the country to provide readily accessible contact points for its learners. After passing of 15 years since its inception, BOU has lagged behind in using technologies. In consideration of its limit to conventional method in teaching, a project was undertaken to test the effectiveness and viability of interactive television (TV) and mobile's Short Message Service (sms) classroom and explore the use of available and appropriate technologies to provide ICT enabled distance tuition. In this project, the mobile technology's sms along with perceived live telecast was used to create ideal classroom situation for distance learning through the Question Based Participation (QBP) technique. The existing videos of BOU TV programs

were made interactive using this technologies and technique. The existing BOU TV program and interactive version of the same were showed to same learners of BOU to evaluate its effectiveness. It is found from the study that this interactive virtual classroom significantly perform well in teaching than BOU video programs (non-interactive) which is used at present [16].

Another paper presents and discusses NKI (Norwegian Knowledge Institute) Distance Education basic philosophies of distance teaching and learning and their consequences for development of a learning environment supporting mobile distance learners.

For NKI it has been a major challenge to design solutions for users of mobile technology who wish to study also when on the move. Thus, when students are mobile and wishing to study, the equipment and technologies they use will be in addition to they equipment used at home or at work. The solutions must be designed in ways to allow both users and non-users of mobile technology to participate in the same course. This means that we have looked for solutions that are optimal for distributing content and communication in courses, independent on whether the students and tutors apply mobile technology or standard PC and Internet connection for teaching or learning. The learning environment must efficiently cater for both situations and both types of students. The solutions were developed for PDAs. During the time of the development and research the technologies have developed rapidly. Mobile phones are including PDA functionalities and vice versa. In principle the aim of developments is to design solutions that can be used on any kind of mobile devices.

The paper builds on experiences from four European Union (EU) supported projects on mobile learning: From e-learning to m-learning (2000-2003), Mobile learning – the next generation of learning (2003-2005), Incorporating mobile learning into mainstream education (2005-2007) and the ongoing project, The role of mobile learning in European education (2006-2008).

Most NKI courses are not designed to function as online interactive e-learning programs, although some parts of the courses may imply such interaction with multimedia materials, tests and assignments. The courses normally involve intensive study, mainly of text based materials, solving problems, writing essays, submitting assignments and communicating with fellow students by e-mail or in the web based conferences. This means that most of the time the students will be offline when studying. From experience we also know that the students often download content for reading offline and often also print out content for reading on paper. All aspects and functions of mobile learning in the NKI large scale distance learning system is clearly an additional service to the students [17].

Mobile Assisted Language Learning (MALL) describes an approach to language learning that is assisted or enhanced through the use of a handheld mobile device. MALL is a subset of both Mobile Learning (m-learning) and Computer Assisted Language Learning (CALL). MALL has evolved to support students' language learning with the increased use of mobile technologies such as mobile phones (cellphones), MP3 and MP4 players, PDAs and devices such as the iPhone or iPad. With MALL, students are able to access language learning materials and to communicate with their teachers and peers at any time, anywhere [18].

5. Conclusion

In this paper we studied the problems of imparting distance learning through multimedia in developing countries. We suggested mobile technology a viable and affordable media through which distance learning could be imparted to billions of people in an efficient

way. We presented some examples of achievements in this field in this paper. More research needs to be carried out to tap the vast opportunity of reaching to billions in developing countries through mobile technology and gearing up multimedia technology to be easily transported to those locations.

References

- [1] Passerint, K., and Granger, M.J., "A Developmental Model for Distance Learning Using the Internet, Computer & Education". 34, (1) (2000)
- [2] Rahman, H., "Interactive Multimedia Technologies for Distance Education in Developing Countries - Introduction, Background, Main focus, Future trends, Conclusion", <http://encyclopedia.jrank.org/articles/pages/6637/Interactive-Multimedia-Technologies-for-Distance-Education-in-Developing-Countries.html> (2000)
- [3] Davison, R., Vogel, D., Harris, R., and Jones, N., "Technology Leapfrogging in Developing Countries – An Inevitable Luxury?", *Journal of Information Systems in Developing Countries* (2000)
- [4] Traxler, J., "Mobile learning in 'developing' countries – not so different", <http://www.receiver.vodafone.com/mobile-learning-in-developing-countries> (2008)
- [5] Vuksanovic, I., Zovko-Cihlar, B., and Boras, D., "M-Learning in Croatia: Mobile multimedia systems for distance learning", http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=4418832&isnumber=4418780 (2008)
- [6] World Resources Institute Digital Dividend – Lesson, from the field: Distance education, http://www.digitaldividend.org/pubs/pubs_03_overview_distance_education.htm
- [7] Ruth, S., and Giri, J., "The Distance Learning Playing Field: Do We Need Different Hash Marks?", http://technologysource.org/article/distance_learning_playing_field/ (2001)
- [8] Verma, R., "Distance Education in Technological Age", Anmol Publications, New Delhi, ISBN 81-261-2210-2, 419, <http://tojde.anadolu.edu.tr/tojde18/reviews/review2.htm> (2005)
- [9] Semret, N., "Intelsat Brings Internet and New Technologies Summit to Africa, Email Message sent to the AFRIK-IT Discussion List", March 24, 1999
- [10] Nidumolu, R., Goodman, S., Vogel, D., and Danowitz, A., "Information Technology for Local administration Support. The Governorates Project in Egypt", *MIS Quarterly*, 20, 2, 197-224 (1996)
- [11] Nhoybouakong, S., Ng, M.L.H. and Lafond, R, <http://www.panasia.org.sg/hnews/la/la01i001.htm> (1999)
- [12] Enns, H.G. and Huff, S.L., "Information Technology Implementation in Developing Countries: Advent of the Internet in Mongolia", *Journal of Global IT Management*, 2, 3, 5-24 (1999)
- [13] Jurich, S., "Before the e-mail there was the p-mail: Distance learning by postal correspondence". *TechKnowLogia*, 1 (1), http://www.techknowlogia.org/TKL_active_pages2/TableOfContents/main.asp?IssueNumber=1 (1999)
- [14] Hauge, H., and Ask, B., "Qualifying University Staff in developing countries for e-learning", http://www.eife-1.org/publications/proceedings/ilf08/contributions/Supporting%20Lifelong%20Learning%20and%20Employability/Hauge_Ask.pdf, (2008)
- [15] "Using Mobile Technology for Learner Support in Open Schooling", www.col.org/sitecollectiondocuments/
- [16] Alam, M.S., and Islam, Y.M., "Virtual Interactive Classroom (VIC) using Mobile Technology at the Bangladesh Open University (BOU)", wikieducator.org/images/4/45/PID_563.pdf
- [17] Dye, A., and Rekkedal, T., "Enhancing the flexibility of distance education through mobile learning" The European Consortium for the learning Organisation, ECLO – 15th International conference, Budapest, May 15-16, 2008
- [18] "Mobile Assisted Language Learning", en.wikipedia.org/wiki/Mobile_Assisted