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Multimedia Technology and Distance Learning Using Mobile Technology in Developing Countries

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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 [13], [17]. In the 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 [15].

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 [13]. 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 chapter 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 advancements developing countries are making to make use of mobile technologies. Section three presents the issue of usage of mobile technology with advanced multimedia tools in distance learning in developing countries. We put our concluding remarks in section four.

2. Analyses of works done

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 [13].

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 [15].

Mobile learning refers to the use of mobile or wireless devices for the purpose of learning while on the move. Typical examples of the devices used for mobile learning include cell phones, smartphones, palmtops, and handheld computers; tablet PCs, laptops, and personal media players can also fall within this scope [8]. The first generation of truly portable information has been integrated with many functions in small, portable electronic devices [14]. Recent innovations in program applications and social software using Web 2.0 technologies (e.g., blogs, wikis, Twitter, YouTube) or social networking sites (such as Facebook and MySpace) have made mobile devices more dynamic and pervasive and also promise more educational potential [12].

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 [15].

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 [2].

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 [2].

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"[2].

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 [2].

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 [2].

PAN is also responsible for linking Laos to the Internet. The Science, Technology and Environment Organization (STENO) of the Laos 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].

3. How to use mobile technology with advanced multimedia tools

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. Instructions could be sent through emails to mobiles of the distance learners. Also relevant website addresses could be transmitted to their emails and they could then visit those sites of distance learning through the internet of their mobiles.

In his book, Mayer (2001) declares that while learning from the text-only books results in the poorest retention and transfer performance, learning from books that include both text and illustrations and from computer-based environments that include on-screen text, illustrations, animations and narrations results in better performance [9].

Similar to e-Learning, mobile technologies can also be interfaced with many other media like audio, video, the Internet, and so forth. Mobile learning is more interactive, involves more contact, communication and collaboration with people [20].

The increasing and ubiquitous use of mobile phones provides a viable avenue for initiating contact and implementing interventions proactively. For instance, Short Message Service (SMS) is highly cost-effective and very reliable method of communication. It is less expensive to send an SMS than to mail a reminder through regular postal mail, or even follow-up via a telephone call. Further, no costly machines are required (which is clearly the case in terms of owning a personal computer). Besides SMS, distance learners can use mobile phones/ MP3 players to listen to their course lectures, and for storage and data transfer. New technologies especially mobile technologies are now challenging the traditional concept of Distance Education [21]. Today the more and more rapid development of the ICT contributes to the increasing abilities of the mobile devices (cell phones, smart phones, PDAs, laptops) and wireless communications, which are the main parts of the mobile learning. On the other hand for the implementation of mobile learning it is necessary to use a corresponding system for the management of such type of education [4].

The use of mobile technologies can help today's educators to embrace a truly learner-centred approach to learning. In various parts of the world mobile learning developments are taking place at three levels:

- The use of mobile devices in educational administration
- Development of a series of 5-6 screen mobile learning academic supports for students
- Development of a number of mobile learning course modules [5].

Research into the current state of play in Europe indicates:

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.
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 [19].

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 [1].

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 the 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 multi-media 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 [3].

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 [10].

4. Current limitations of mobile technology and how to overcome these

4.1 Current limitations of mobile technology

Every technology has some limitations and weaknesses, and mobile devices are no exception. They have shown some usability problems. Kukulska-Hulme summarized these problems as follows: 1) physical attributes of mobile devices, such as small screen size, heavy weight, inadequate memory, and short battery life; (2) content and software application limitations, including a lack of built-in functions, the difficulty of adding applications, challenges in learning how to work with a mobile device, and differences between applications and circumstances of use; (3) network speed and reliability; and (4) physical environment issues such as problems with using the device outdoors, excessive screen brightness, concerns about personal security, possible radiation exposure from devices using radio frequencies, the need for rain covers in rainy or humid conditions, and so on. It is important to consider these issues when using mobile devices and designing the learning environment [7]. We expect mobile producers would take care of these problems in the near future.

4.2 How to overcome these

However, looking at how rapidly new mobile products are improving, with advanced functions and numerous applications and accessories available these days, the technical limitations of mobile devices may be a temporary concern. Also, the use of mobile technologies in education is moving from small-scale and short-term trials or pilots into sustained and blended development projects [18].

The most serious issue faced by mobile learning is the lack of a solid theoretical framework which can guide effective instructional design and evaluate the quality of programs that rely significantly on mobile technologies. As Traxler pointed out, evaluation of mobile learning is problematic because of its "noise" characteristic with "personal, contextual, and situated" attributes (p. 10). Several attempts to conceptualize mobile learning have been made since the emergence of mobile and wireless technologies [18]. Traxler provided six categories by reviewing existing trials and pilot case studies in the public domain: 1) technology-driven mobile learning, 2) miniature but portable e-learning, 3) connected classroom learning, 4) informal, personalized, situated mobile learning, 5) mobile training/performance support, and 6) remote/rural/development mobile learning [18].

Koole developed a framework for the rational analysis of mobile education (FRAME) model which presents three aspects of mobile learning: the device, the learner, and the social environment. This model also highlights the intersections of each aspect (device usability, social technology, and interaction learning) and the primary intersection of the three aspects (mobile learning process) in a Venn diagram. What makes this FRAME model useful are the criteria and examples of each aspect and interaction and the checklist that might help educators plan and design mobile learning environments [6].

The definitions, technological attributes, and existing frameworks of mobile learning introduced above can help readers gain an understanding of mobile learning and how it is relevant to the future of teaching and learning with mobile technologies. However, previous studies and efforts suffer from the lack of a pedagogical framework. A number of the applications of mobile technologies in learning have shown a few links to established pedagogical theory. There is a need for the many different directions and unique applications to be logically categorized within the context of distance education. In order to better understand the current status of mobile learning and come up with comprehensive design guidelines for its future use, it is necessary to categorize educational applications with mobile technologies and position them in a logical framework. The transactional distance theory provides a useful framework based on sound theoretical and pedagogical foundations that can define the role of mobile learning in the context of distance education [12]. But as we know with multimedia technologies it's possible to combine more than one media like text, graphics, audios, and videos together in preparing study materials which go a long way in providing effective distance learning through mobile technologies.

5. Conclusion

In this chapter 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 chapter where we can use telephone, photography, audio, video, internet, eBook, animations and so on in mobile and deliver effective distance education in developing countries. In the developed countries the majority of students already use their mobile devices to interact with and learn from the world around them and a world class room is created. They engage their current situation with texts, tweets, and Facebook updates to their friends. They yelp out for help finding a place to eat dinner and report back their findings. Some even use Goggles to find information about their surroundings from a picture. And they already do this in our class rooms [16]. But for developing countries it would take a while to reach this stage. 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 technologies to be easily transported to those locations.

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As multimedia has become a very important technology, significantly improving people's lives, this book provides an up-to-date scenario of various fields of research being carried out in the area. The book covers topics including web-based co-operative learning, effective distance learning through multimedia, quality control of multimedia on the internet, recovery of damaged images, Network-on-Chip (NoC) as a global communication vehicle, and Network GPS for road conditions (such as traffic and checkpoints). We believe that the book will help researchers in the field to proceed further in their research on multimedia.

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