DISTANCE EDUCATION SYSTEM FOR REMOTE ISLANDS IN MALDIVES

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Abstract

Maldives consists of a group of 1190 islands. With a population of only 26000 and 200 inhabited islands, more than 90% of the islands consist of less than 1500 people. The low population density in the islands limits the infrastructure developments mainly due to the lack of economies of scale. This has also affected the availability of secondary schooling opportunities for most islanders. This research describes the development of a distance education model to provide access to secondary education through information and communications technology.

1. Introduction

Maldives is an island nation with a chain of 1190 islands scattered across the Indian Ocean. Out of the 1190 islands, only 200 islands are inhabited with an additional few others developed exclusively as tourist resorts. Almost 99% of the country being the ocean the main form of transport between the islands is by sea. The absence of regular ferries between islands makes the travel much more difficult. The capital of Maldives is Malé and one third of the country's population (about 80 thousand) lives in the capital. In addition to Malé, only three other islands have population of more than 5000 people, and 95 islands have population of 500 people or less. The low population density in the islands limits the infrastructure developments mainly due to the lack of the economies of scale. This is also the case in education where building a school to cater for a couple of students will not be cost effective but rather a waste of resources. On the other hand the capital cannot accommodate the island population as it is already overcrowded with about 80000 people living in one and a half-square kilometre of land area. Hence providing education to the island population through distance mode becomes an appealing alternative. This paper looks distance education model designed to suit Maldivian context. The paper outlines the current situation in Maldives and provides a distance education model that can reach the students in Maldives.

2. Infrastructure

One of the challenges in providing education in Maldives is providing access to the students. At present Maldives has universal primary education with a primary school in

every inhabited island. However, when the students complete their primary education they will have to relocate themselves to an island where secondary schooling is available. Access to high school is only available in the capital hence the students will have to relocate themselves to the capital (Ministry of Education Website, Online). Furthermore only 10 percent of the students who complete secondary education can get in high school due to lack of placements. Table 1 shows the decrease in enrolments from year 8 to year 12. The main reason for this decrease is due to the lack of schools in the country.

Year	Islands	% decrease	Capital (Malé)	% decrease	Total	% decrease
Yr 6 (Age 12)	10521	-11%	2668	-25%	13189	-13%
Yr 7 (Age 13)	10773	-2%	3331	-25%	14104	-7%
Yr 8 (Age 14)	4134	62%	4128	-24%	8262	41%
Yr 9 (Age 15)	3059	26%	3014	27%	6073	26%
Yr 10 (Age 16)	2043	33%	1876	38%	3919	35%
Yr 11 (Age 17)	0		400	79%	400	90%
Yr 12 (Age 18)	0		238	41%	238	41%

Table 1: Enrolment figures for 2000 in Maldives (Source: Ministry of Education Website, Maldives)

The lack of access to secondary and high schools and lack to transport between islands on a daily basis has led this research into looking at other alternatives. Hence providing education to the island population through distance mode has been found to be the best alternative. Since the major barrier of providing education has been reaching the students this research has concentrated on providing access to the students. Hence this research looked at the existing communications infrastructure in Maldives and what delivery media can be used in the Maldivian context.

The communications infrastructure has contrasting levels of development between Malé and other islands. In Malé the communication infrastructure is highly developed with public having universal access to telephones, radio, television, and Internet. The island population has universal access to radio through a state-owned radio station. However, only 55 percent of island population have a radio at home with few variations between islands (UNDP, 1998). Television Maldives (TVM) is the only television station in the country. TVM is state-owned and only the capital and few nearby islands receive its broadcasts using the rooftop aerials. Recently TVM has introduced satellite television using encoders, which reaches all parts of country. However, majority of the island population are unable to access this as they need to purchase or rent decoders to view the broadcasts which is too costly. All the atoll[1] offices have satellite receivers and decoders and public have access to

[1] A coral island or islands, consisting of a belt of coral reef, partly submerged, surrounding a central lagoon or depression; a lagoon island

their premises to view television programmes on restricted times. Statistics also show that only 15 percent of the island population have a television at home (UNDP, 1998). Maldives has recently achieved the target of installing telephones on all the inhabited islands. However, all the islands do not have access to public telephone nor have telephone network for the households. In these cases the public can use the telephone in island offices. Telephones are available in all the government offices (atoll offices and island offices) and schools in the islands. Even where telecommunications infrastructure allows household connections the cost limits access.

Internet was introduced in Maldives in 1996 and has since been expanding at a rapid pace. Mainly the expansion in terms of usage can be seen in the capital although the service has been extended to provide universal access in Maldives. In addition to the capital cyber cafes for the public exist in the southern most and northern most atolls. The number of cyber cafes is on the increase throughout the country as more people are using the Internet. Although access is available the high costs of installation and usage limits the number of users. The Internet is charged on the minute and the charges are much higher than those in many developing countries (ADB, 2001).

In addition Maldivian government with the aid of Asian Development Bank (ADB) has established a national computer centre in Maldives. One of the initiatives of this centre is to establish Internet kiosks in remote atolls where the public can have access to Internet and computer services. The Internet kiosks will be initially housed in the atoll offices. These kiosks will be connected to the government computer network allowing public to access the network. In addition, the centre will train assistants who will staff each of the kiosks.

Furthermore Ministry of Education has started a Basic Computer Literacy Project aiming at providing computer literacy for all the students who complete primary education. As primary education is compulsory in Maldives this will aim at providing universal computer literacy in Maldives. This project will provide all schools with computers with multimedia capability including CD ROMs (Ministry of Education, 2001).

3. Choice of Technology and Delivery Systems

The dimensions used by Aggarwal and Bento (2000) can be used to identify the choice of media in different teaching environments. They use time and place to classify four major types of teaching environments. Each teaching environment requires a different set of technology or delivery media for instruction. The four types of instruction are same time/same place; any time/same place; same time/any place; and any time/any place. A similar approach has been used in this research to identify the best media technology suited to deliver instruction in Maldives.

The same time/ same place category represents traditional face-to-face classrooms where students attend classes at the same time for instruction (Aggarwal and Bento, 2000). Maldives is unable to build schools in each of the islands to deliver secondary education using traditional face-to-face classrooms hence this category is not an option for Maldives.

Students attending study centres and labs to interact with teachers and other students are categorised as any time / same place instruction. Major distance education providers like British Open University uses local study centres to support students by means of tutor support, library facilities, and other interactions (McIsaac and Gunawardena, 1996). Bangladesh Open University (BOU) uses tutorial centres to deliver tutorials to the students on a fortnightly basis (Rumble, 1999: 170 and Bangladesh Open University, Online). This option is not feasible in Maldives as there are no regular ferry services between the islands hence students will not be able to travel to regional study centres for regular tutorials or classes. However, people travel between islands within an atoll almost everyday and students will be able travel to a regional centre at least once a week. In most of the distance education institutions study centres were used to provide students with access to media equipment, library facilities, computer access, etc rather than tutor-student interaction (McIsaac and Gunawardena, 1996). Alternatively Maldives can use local computer centres (within the islands) as local study centres where student have access to computers and use regional centres as the regional hub between the headquarters and the local centres and students.

Same time / any place instruction are delivered simultaneously to students widely dispersed geographically via one-way or interactive media. Broadcast media (radio and television) is an ideal technology for this type of instruction. Radio is widely used in developing countries because it is much cheaper option compared to other more sophisticated technologies (Tripp and Roby, 1996). Radio is universal in Maldives and almost everyone listen to it. Radio is mainly used for informal informative programmes without any assessable components. Television has been used for similar programmes, which were mainly public awareness programmes. Television is now available to all islands through special receivers making the access limited in some of the islands. Broadcast media is excellent in reaching the public with these kinds of programmes due to its immediacy. However, with formal education interactivity is an important component which broadcast media lacks. Also the fact that only 55 percent and 15 percent of islands population have radio and television respectively at home make this media choice incompatible.

Instruction using two types of technologies can be categorised as any time / any place. They are technologies that deliver one-way information such as print, audio and videocassettes and those that provide interaction (McIsaac and Gunawardena, 1996). Print, audio and videocassettes will work in parts of the world where the postal service is reliable. Maldives postal service to the islands is highly unreliable hence this medium of instruction is impractical in Maldives. The second set of technologies (interactive) categorised under this type is further divided into instructor-learner interactive technologies and learner-machine interactive technologies. Again instructor-learner interactive technologies need to be minimised in this research as human resources are scarce in Maldives. Hence more focus is given on how to maximise on learner-machine interaction and identify a suitable model for Maldives.

Indhira Gandhi National Open University (IGNOU)'s model of virtual campus (Sharma, 2001: 4-5) is too advanced for Maldives with its current infrastructure. The government is in the process of implementing a national information infrastructure, which involves the interconnection of all inhabited islands of the Maldives with a modern information

infrastructure (MCST, Online). Once this is established Maldives could look into the possibility of virtual campuses in some island centres. However, huge amounts of foreign aid need to be secured before this project can be implemented. In the meantime alternatives need to be found using the current infrastructure. Ministry of Education launched a project to provide computers to the schools without a single computer (Ministry of Education, 2001). This project will result in resource rooms in each of the schools with computers. These computers will be available to deliver distance programs to the students using a computer-based approach similar to the one used at IGNOU. However, distance programs completely depending on these computers will not be a viable option as the Ministry is planning to have only one computer per sixty students. This will not give an adequate student computer ratio for this purpose. Other facilities under consideration are computer networks and Internet kiosks in the islands. Currently computer networks exist in few islands with Internet kiosks and cyber cafes on the increase. These can be used as study centres as the personal computer ownership is not high in the islands. The technology is quickly moving to the atolls and islands of Maldives but the geography of the country makes this quite challenging. In addition, telephone is available in all inhabited islands making Internet possible in all the islands.

In addition to focussing on the strengths and weaknesses of different technologies, Maldives has to capitalise on the available technology at different levels. For example computer-based instruction with Internet could be used in parts where possible, while computer based instruction using computer networks at schools and other planned kiosks could compensate in other areas. Consequently Maldives should look into developing a system where media is selected according to availability and which allows easy transfer from one medium to another if and when more advanced telecommunications capability is introduced. The designed system looks at ways of minimising human resources however it is unreasonable to totally eliminate it. Hence computer networks, with Internet wherever possible, and CD ROMs will be used to for delivery.

4. Model

The model comprises of a student module, a regional module, and a headquarters module. The student module is sent to each student, the regional module is set up in each of the regional centres, and the headquarters module resides at the central location. A three-tier model is used as most students will not have access to Internet which makes it impossible for them to connect to the headquarters. Hence the middle layer at the regional level (regional module) connects the students with the headquarters. Most communications between the students and the regional module will be done through data on floppy disks. However, if the student has access to Internet, Internet can be used as the means of communication. The details of this process are explained in the next section 4.1. All the communications between the regional module and the headquarters will be done via Internet on a regular basis.

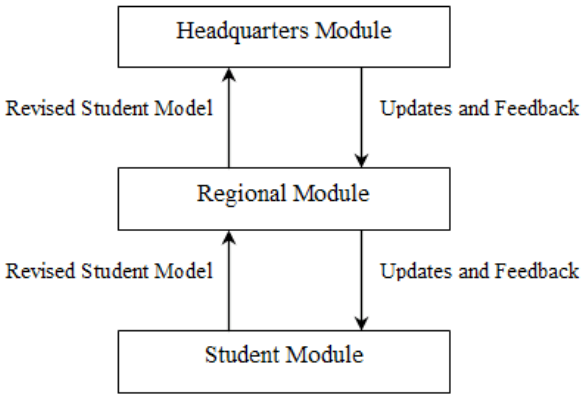

Figure 1: Structure of the Model

4.1 Student Module

A student model is the system's view of the student. The information held in a student model is generally categorised as domain-specific and domain-independent information. Domain-specific information represents the student's current state and level of knowledge relating to a particular concept (Brusilovsky, 1994). The student model for this system is based on the overlay model, as this model is widely used and tested in the domain of this literature. Overlay model represents the learner's knowledge as a subset of domain knowledge. The student model needs to be initialised before the student engages in the learning and kept up-to-date as the student progresses through learning stages. The following sections explain how system initialises and updates the student model.

The student will send their application to the headquarters for enrolment. These applications will be assessed and approved before they will be enrolled in the system. Enrolment will be done at the headquarters using the headquarters module. Students are also able to apply online but will go through the same process of approval at the headquarters. The enrolment procedure is the first part of initialisation of the student model. As this system is designed for secondary education the application includes information on results of previous years in addition to the factual data on the students. This will give an indication of students' prior knowledge of the domain. The enrolment procedure creates the student model for each student with the factual data on the student as well as prior knowledge of the student. The student model is then uploaded into a repository at the regional centre which contains all the student models of students for that region. The students are sent the student model on floppy with the system setup CDROM. Once the set up is completed the system asks for the student model floppy to be inserted. This creates the student model in the student's computer. Figure 2 shows the process of initialising student model.

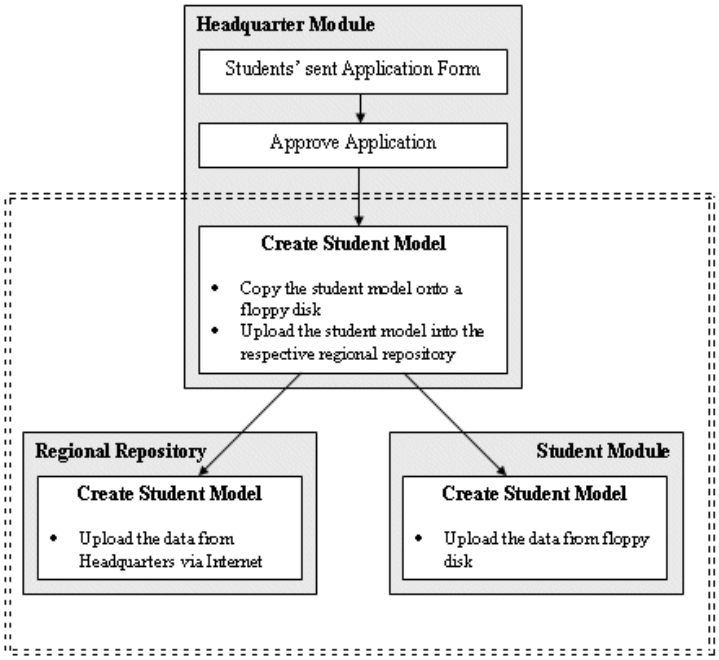

Figure 2: Initialising Student Model

In this system there are three different levels of updates for student model (Figure 3). One will be the usual updates carried out, as any other intelligent learning environment, when student engages in learning and the second will be synchronising all the instances of the student model. These updates will be carried at the student module and the repositories (explained later). The third update is at the regional and headquarters module which is covered in latter sections (see sections 4.2 and 4.3).

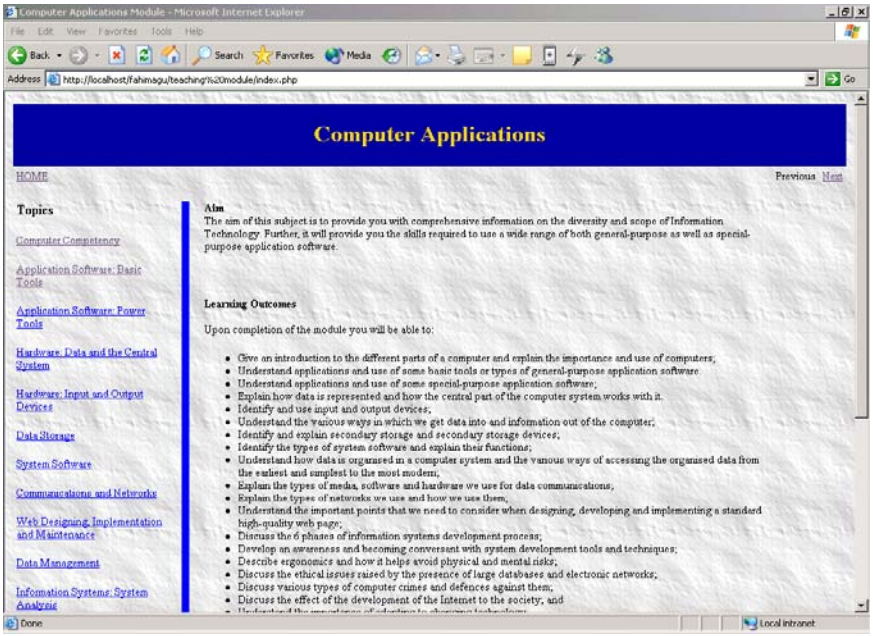

Figure 3: Content Interface for the student

The content is organised into several topics and presented to the students. Each topic will have a set of learning units. Each of these learning units is the smallest measured unit of competency. The students are required to achieve a certain level of competency in each of these learning units to progress from one topic to the other. At the end of each learning unit the student will have to complete a set of assessments to show their competency in that learning unit. These assessments are merely to find out their competencies and are recorded in a database. These do not count as their formal assessments but is used to send feedback to the students. Once they achieve competency in one learning unit they can proceed to the next. Figure 3 shows an example of how the content is displayed for the student.

4.2 Regional Module

From time to time the student will have to upload their student model into the regional module. This can take place via the Internet or by taking the floppy to the regional centre. Once the student uploads their student data into the regional module they get updated in the regional module. Every time the student uploads their data it goes into a regional repository which acts as a backup for student models in that region. When the students upload their student models it will be checked against the student model stored in the repository. If the student model in the repository is more up to date then the student's version of student model will be updated. Once the upload is completed any feedback from the regional module will be loaded into the student floppy (or via online when uploading is done online). The students can then use the floppy to update their system.

At regular intervals the regional module creates a cumulative student model for that region (Figure 3). Initially the regional student model will have zero competencies for all the learning concepts, units and questions. These get updated as students upload there student models. At a specified time data analysis is done on the repository held at the regional centre to see if there are any updates on the student models. These updates are then compiled into the regional student model. This update process will identify cumulative frequency of students doing a particular question wrong, having difficulty with any given learning unit, doing well at modules etc. At the regional module the competency levels are compiled and stored as frequencies. For example for each of the learning units the regional module will store the number students who have not completed the prerequisites, number of student who are ready to start, number of students who have visited, number of students who have completed, and number of students who have mastered. Likewise it stores the frequencies of competencies for learning concepts as well as questions.

The students will receive feedback from the regional module when they upload their student model. This feedback is based on previous updates for the student and general feedback for the region. The feedback will also include any updates to the system. The students can load these feedbacks onto their floppies and consequently update their system.

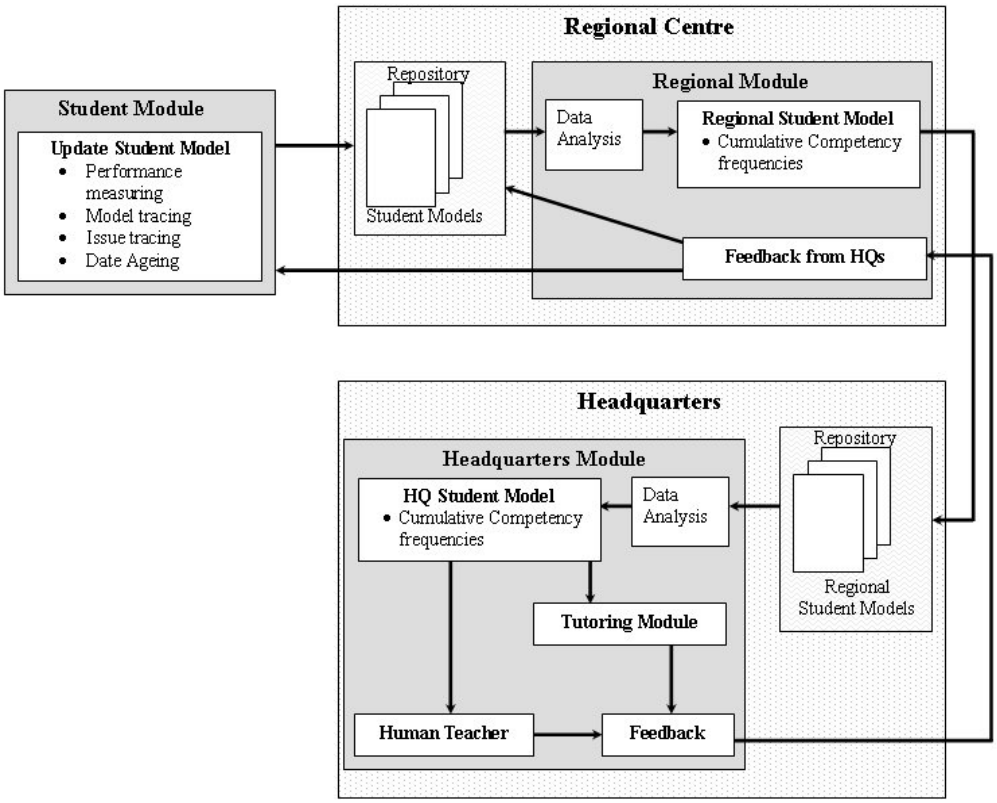

Figure 4: Updating Student Model

4.3 Headquarters Module

The same data structure is held at the headquarters but the data compiled are for the whole country instead of region. The process of updating the student model at the headquarters is the same as that at regional module with the only difference being that the student model created at the headquarters will reflect a nationwide student profile. Every time an update is made to the regional student model this is uploaded into a repository held at the headquarters. This process is done via the Internet and this repository will act as a backup for regional student models. Data analysis on this repository will be carried out at regular intervals and the headquarters student model will be updated. This process helps to identify common mistakes made at regional as well as national level and depict a common pattern of student behaviour at these levels. This will help identify which content areas require more attention and which areas are reasonably catered for.

The feedback process starts at the headquarters module based on these updates. Using the updates the headquarters module will identify which areas require the feedback. The initial feedback comes from the tutoring module which will identify responses according to the problems. The tutoring module includes an expert module where subject matter is stored. Human intervention is available at the headquarters when there is a lack of system based feedback. The feedback includes both content updates, frequently asked queries and responses, and common student mistakes both at a regional and national level. Once the feedback is entered into the headquarters these are sent to the regional module via Internet. At the regional centres these updates are passed onto the students.

5. Conclusion

The system will help achieve access to secondary education throughout the country with a minimal expenditure on the infrastructure development. The system capitalises on the existing infrastructure and technology in the country reducing the costs required for implementation. In addition the system also considers ongoing and planned infrastructure developments which will be completed by the time the system is ready for implementation. It also has the capacity to expand as and when required, e.g. when Internet is readily available content can be delivered online rather than CDROM. The system can be used as a model for other developing small island states to design distance education programmes.

One of the major differences between this system and other commercially available systems is that this system consists of a two-layered approach where the students with and without online connections are both catered with adequate adaptivity. The adaptivity will help realise individualised instruction for each and every student and help reduce the need for extensive human intervention. This will help overcome the problems faced by Maldives and many other developing small island states due to the lack of human resources.

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