COLLABORATIVE DIGITAL LIBRARIES: A MODEL FOR THE SUPPORT OF SMART INSTRUCTION AND LEARNING

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Abstract

This paper describes the conceptualisation of a model for digital libraries for Malaysian schools, which supports classroom instructions and learning. Malaysia is rich in her national heritage of published and unpublished works - biographical repositories, art works, students' projects, etc. - that can support and enrich instruction and learning in a smart environment. Digital libraries play a major role in the Smart Education environment as the central concern is in providing fast and easy access to digital information resources without the constraints of time and geographic boundaries. The move towards collaboratively building the content of a digital library is a fairly recent trend. Collaborative digital libraries simulate an environment where partners are empowered to participate in building and up keeping the knowledge content of the system. A model of a collaborative digital library incorporates five basic features: a) uploading and indexing, that support creation, capturing and sharing of learning objects from distributed sites and user groups; b) supporting multi-format digital resources; c) searching and retrieval of contents of stored objects; d) provision of user control display; and e) basic security to control user access and protect library contents. The conceptualisation of Malaysian digital libraries must address issues such as identifying local resources, ascertaining the needs of it users, and establishing a framework plausible to meet these needs. It may be approached through the establishment of test beds in a particular learning institution, before wider implementations.

Introduction

The term digital library means different things to different people. Its meaning ranges from a digitised collection of material to a collection of all digital information along with the services that make the information useful to all possible users. Sometimes it is used interchangeably with terms such as virtual library, electronic library and a library without walls. Wainright (1998) simply defines it as, "a digital library remains a library, with the same purposes, functions and goals as a traditional library. The digital part of the term indicates merely that the material is stored and accesses digitally."

However, the DLib Working Group on Digital Library Metrics (WG) 1998 proposed the following definition of a digital library, " .... The digital library is the collection of services and the collection of information objects that support users in dealing with information objects and the organisation of those objects available directly or indirectly via electronic means. Thus, digital library is a generic name for federated structures that provide users with both intellectual and physical access to huge and growing nation-wide networks of information encoded in multimedia formats".

Digital library research and development has accelerated tremendously since 1990. There are numerous examples of digital libraries currently available on the World Wide Web and this paper will highlight a few. The Archivo General de Indias, the digitisation of the Spanish Archives relating to Spain's early colonisation of the Americas, which was undertaken by the Spanish authorities and IBM, is one of the first large-scale experiments in digital library. In the United States, the National Aeronautics and Space Administration (NASA) and the Advanced Research Projects Agency (ARPA) established the United States National Science Foundation's Digital Library Initiative with 6 major projects worth over US$3.0 million each. The 6 projects namely, Carnegie-Mellon University – Informedia Digital Video ; Stanford University ; University of California at Berkeley ; University of California at Santa Barbara – The Alexandria Project ; University of Illinois – Digital Library Initiative, and University at Michigan, explored major issues involving large scale digital libraries (Wainwright, 1996). The European Union has undertaken 2 programmes – the Telematics for Libraries Programme and Info 2000 Programme. In the United Kingdom, there is a series of ongoing programmes under the Electronic Libraries Programme. Various programmes are running in Australia including the Australian Cooperative Digitisation Project and the World 1 : National Document and Information Service (Wainwright, 1996). American Memorial

of the Library of Congress initiated by the US Government is another fine example of a digital library. The digital resources, contains over seven million items, include photographs, manuscripts, rare books, maps, recorded sound and moving pictures. Malaysia's national attempt at developing a digital library is exemplified by MyLibrary. MyLib's digital collection is organized into seven categories; books, e-zines, newspapers, newspapers, multimedia, conferences, maps and reports. However, this digital library does not in itself develop its own electronic resources, but create hyperlinks to other digital resources available on the Web (Zainab, Abrizah and Ng, 2002).

At the Conference on Advanced Computers in Education (CATE'96), delegates unanimously agreed to "advocate for the digital library of the future, one rich, common, and free digital library that will gather the collective legacy of human knowledge and information, that will make that information available to anyone, anywhere, anytime" (Masullo, 1996).

Digital Library In Education

With the advent of technology and easy access to information via the Internet, there is a need to make education a primary activity that can be supported by new information and communications infrastructures. Learning is a process that occurs with a significant amount of teaching in the presence of a teacher. However, with the application of technology, learning can be achieved by such strategies as the use of CD-ROMs, other interactive multimedia courseware, and Internet-supported activities and courses. One such medium is the digital library. Educators in the new era of globalisation should be able to combine learning with content access through the use of technology. Textbooks will no longer be the sole source of information for both the teacher and the student.

Various materials that can be used for education are now widely available in digital form. Collection of these materials which exist in both physical and digital forms can be used in the various teaching and learning processes. Access to and usage of these materials can be achieved via the digital libraries. Masullo (1996) brought forth the concept of a Universal and Global Education Infrastructure stating that digital libraries act "as the foundation, or underlying set of components that can be used to support various forms of networked teaching and learning activities; and to the organized collections of literary and artistic materials, in digital and other forms, needed to carry out those activities on a global scale".

Thus, within this context and framework, the digital library is an education infrastructure. It cannot teach but it provides support for teaching and learning. Subsequently, a digital library should not be designed to teach and improve learning, and educators should not expect it to teach. But, it is a tool that will support quality and equitable learning which hopefully will result in improved learning and improved outcomes from the same processes.

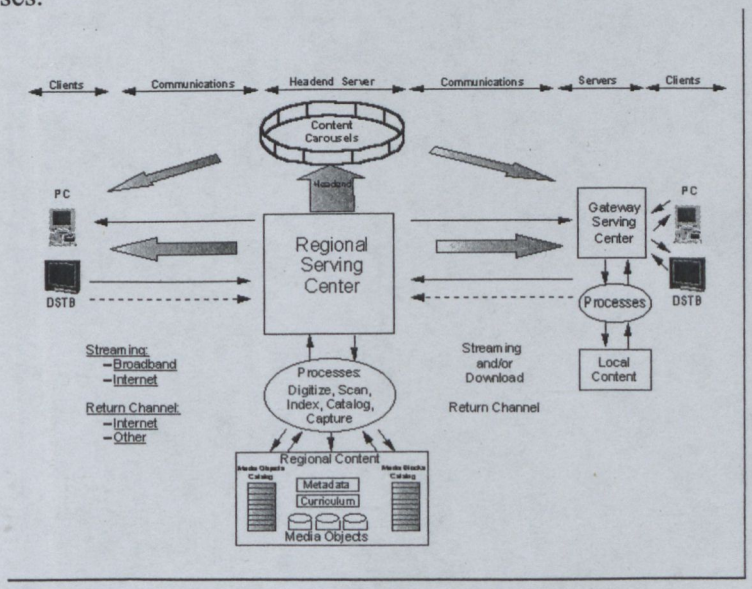

Figure 1 : Eduport End-To-End Architecture
(Source : http://ianwww.unl.edu/eduport/R-CATE96.HTM)

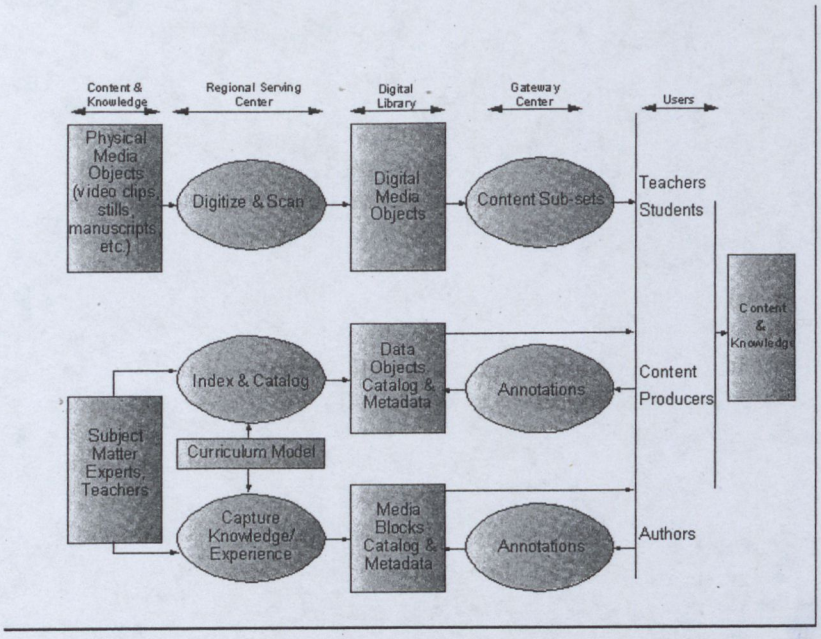

Figure 2 : EduPort Content Framework
(Source : http://ianwww.unl.edu/eduport/R-CATE96.HTM)

In the United States, educationists are experimenting with EduPort which is a prototype and testbed for exploring the concept of a universal and global education infrastructure. The aim of the project is to explore the issues in building or rebuilding the education infrastructures, given new available technologies. It focuses on those technologies accompanied by a methodology for their use and it also focuses on issues that relate to content being the primary application that the infrastructure will support. It has served as a research testbed but is now evolving into a practical initiative and pilot sites are now under development. The fundamental aspects of EduPort includes a systems architecture (Fig. 1) , an application framework (Fig. 2) and a model for collaboration.

The Model for Collaboration in EduPort includes a plan to:

a. Identify and gather content that maps to curriculum goals
b. Convert content to digital form, index and catalog it according to given educational benchmarks
c. Organise content distribution on a regional basis
d. Organise content dissemination locally to schools, other educational institutions and at home
e. Develop a technology solution for making the infrastructure accessible worldwide
f. Share information and influence standards for use of digital technologies on education

Six important features of digital libraries which will support the teaching-learning process have been identified by Wallace, et al. (1996) and Mendel (1996):

a. content is current
b. content is comprehensive
c. content is readily accessible
d. content can be from primary resources
e. resources are presented in various formats
f. student can publish them online
g. reuse of teaching resources

Collaborative Digital Library For Malaysian Secondary Schools

The Smart School is one of the seven flagship applications of the Multimedia Super Corridor. The conceptual blueprint of the Malaysian Smart School was unveiled in July 1997 revealing technology as the driving force behind the Smart School concept. Technology will be the enabling infrastructure for new teaching-learning processes which are related to curriculum, pedagogy, assessment, and teaching-learning materials.

The concept involves putting in place a total integrated solution and its success is highly dependent on this so-called integrated solution. As manager of the Smart School Flagship, Dr Norrizan Ramli stated, "The teaching and learning materials form a component of the integrated solution ... the success will be showcased through the most comprehensive and innovative package for the delivery of education ..." (Transforming the concept ...., 2001).

By 2010, 10,000 primary and secondary schools will become Smart Schools. A real Smart School will ensures that technology employed is utilised and optimised to provide a complete multimedia enhanced educational (Telekom, 2002)

It is fairly obvious that digital libraries will play a central role in the Smart School environment as the central concern is in providing access to information sources. Information plays a crucial role in realising the objectives of smart education which require "qualified knowledgeable educators" and "well-informed and well-supported individuals". Digital libraries are built around the concept of providing fast and easy access to digital information resources without the constraints of time and geographic boundaries. However, the digital libraries in the smart education concept must address the issues of creation and organization of the rich, local resources, besides providing access to other foreign resources.

What are the information sources that are useful towards helping to realise the smart education concept? There are many and varied sources, and increasingly they include different types of media. Assuming that smart education centers on the current school system and culminating with universities in the country, what are the information sources most important to support all the teaching and learning activities at all these levels? Collect and collate all existing available sources and bring into the mainstream those resources that can contribute to the smart education objectives. Educators need to have at their disposal various types of learning resources to become knowledgeable and they also require teaching resources to produce well-informed and well-supported individuals out of the smart education system.

Proposed Model For Collaborative Digital Library: Initiatives At FSKTM, University Of Malaya

The Faculty of Computer Science and Information Technology, University of Malaya has initiated an electronic platform for collaboratively building digital libraries. This is within the Faculty's research interests in developing solutions to support digital libraries. The proposed digital library aims to provide an electronic system to help educators and students obtain accurate information; collect, store and organize information in digital format; publish and share electronic resources; and learn how to use IT to obtain information on local contents. The framework for the establishment of a collaborative digital library involves three different stages as presented in Figure 3, namely basic research, design and construction of testbeds, and deployment, use and assessment.

Any functional digital library should contain five main components (IBM DB2...1998). It should provide for creating and capturing materials and support an array of industry standard and specifications, able to define and import data in varied format, incorporate templates and authoring tools to help in the creation process. It should include an access and distribution module so that information can be distributed over public or privtae networks. The digital library should provide the search and retrieval components so that the contents of the stored learning objects can be searched effectively, utilising keyword searches, Boolean searches and ranking relevant searches. Another necessary component is the authentication and rights management module that control user access and protects the library contents. Finally, digital libraries should incorporate the storage and management of contents that provides high-performance, scalable storage and efficient digital learning objects management. All components are incorporated into the proposal of collaborative digital libraries for Malaysian secondary schools.

The main difference in the proposed model compared to other digital libraries is in the system architecture that allows collaborators such as partner schools, organisations, associations and individuals to cooperatively develop electronic resources and upload the resources to a hosting system. This is consistent with the systems architecture and model for collaboration proposed by EduPort. This is a shift from the traditional concept, where the individual school or school library purchase its own resources, process and disseminate mainly bibliographic information to its users.

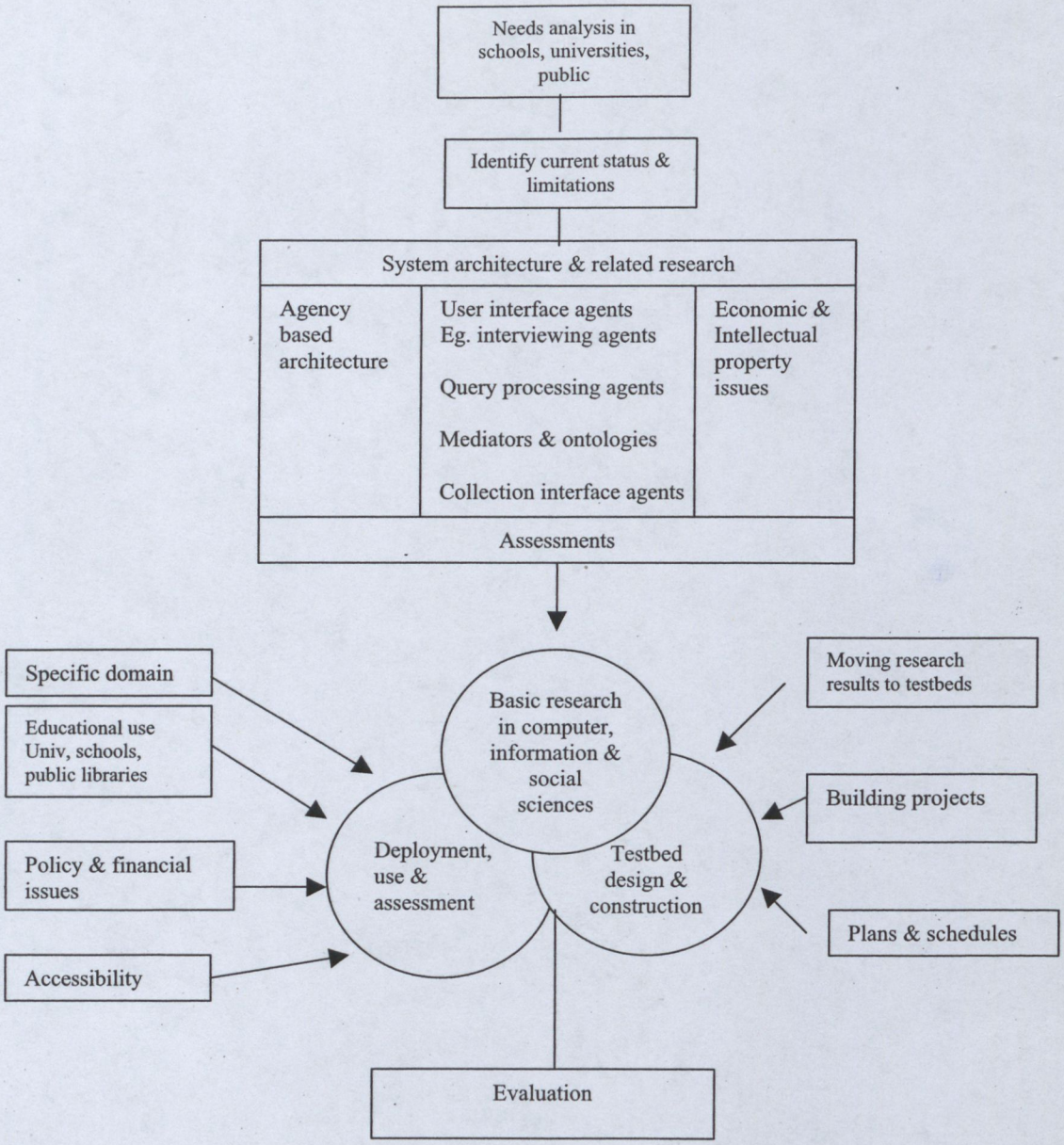

Figure 3: Framework for Collaborative Digital Library

CoreDev – Collaboratively Building Digital Libraries On Local Historical Resources For Secondary School Students

CoreDev (Collaborative Resource Development) is a proposed digital library for historical resources that supports the development of digital content collaboratively. As a test case the system is currently supporting a portal of Malaysian resources on prominent personalities, historical buildings and places. In other words, the system could host uploads of full-text documents, digital audio files, video clips and images from a number of clients or partners. The basis for choosing resources on personalities, buildings and places at this initial stage is to support information needs of students in lower secondary schools in conducting their school-based history projects which usually centres around writing a report on local personalities, historical buildings or places. It is in this context that students use various means of obtaining information. A pilot sample of students interviewed indicated that their quest for information involves library search, scanning the mass media, browsing the Internet, obtaining information from friends or parents, going to actual sites to obtain leaflets and interviewing personalities. The history project forms a good testing ground for developing information literacy skills among students, ascertaining that they know how to assimilate, consolidate and present the information obtained into new meaningful knowledge.

CoreDev provides the platform for building resources collaboratively by member partners in three ways: creation of original digital works, digitization of paper-based resources and providing linkages to other relevant web sites. The system allows uploads of reports, images, audio files and video clips by students themselves, other individuals and teachers. This practice enhances the sharing and discovery of information between various user groups and requires the practice of properly acknowledging and quoting sources used. To safeguard the system's integrity, the digital objects are uploaded into a temporary file which can be viewed and scanned by the system's administrators who may be the teacher librarians or librarians at the State Educational Resource Centres or the Ministry of Education. These administrators could further edit and enhance the description of the multimedia resources through a user-friendly indexing template. All objects finally verified by the administrators are instantaneously searchable over the Internet. A full text documents and objects are searchable through the descriptions given to them. Particular attention is given to the system's search and retrieval functions since it is expected that this type of digital portal is likely to be overwhelmed by numerous electronic information. Users could submit simple keyword searches or apply Boolean operators (and, or, not) to achieve precision. A ranking algorithm has been in-built into the retrieval functions, which assigns a relevancy score to each of the search result. Novice users are also allowed to browse the total contents of the portal or choose to view contents by category of objects (video or audio only). Users can also opt to view thumb-nail images to ascertain relevancy before clicking on them to view. Another unique feature incorporated is the reporting module, which provide administrators with the information about the degree of participation activity of individuals or groups within participating schools in a particular state or in all states. Subsequent phases of this digital library project will further expand contents, incorporating history lessons, teaching tools and questions bank on history for lower secondary schools. The research team at the Faculty is currently looking for partners to collaborate in this project, especially in contributing resources so as to ascertain the integrity and robustness of the system. This would ultimately help achieve the system's goal to provide exposure in the use of local digital libraries and prepare the educational community with the skills to cope with Internet and communication technology as desired by the Malaysian government.

Perceived Benefits Of Collaboratively Building Digital Libraries

The perceived benefits of engaging in collaborative resource development in digital libraries are very real. They include (1) imparting ICT awareness and skill to the educational community; (2) obtaining access to a valuable local content that might otherwise be unavailable; (3) providing more than one type of resources to students in a single location; (4) imparting the skills to reference or cite resources used correctly; (5) reducing the dollar cost in purchasing and storing resources; (6) mutual professional learning and support that occurs when partners commit to and work in such collaboration;

Careful collaboration clearly can help educational communities develop practical partnerships to create and expand local knowledge that subsequently nurtures knowledge sharing at all levels of the society. Teachers and students must recognize the importance of their participation in creating the digital contents and accept the reality that the richness in content of the digital library is dependent upon their active participation as partners.

Conclusion

Digital libraries will be the main tool for education in the 21st century (Masullo, 1996). Internet is emerging as a powerful tool in teaching, training and exchanging information reflecting a new vision of learning in the educational process. The rapid rate in the growth of information and information technology requires great efforts to develop enhanced teaching skills and dynamic teaching curricula. The increasing role of multimedia computer-based learning must be coupled with the retraining of teachers in national educational institutions to improve their abilities in computer and IT. Currently used methods of education and training must be modified to suit future information technologies. Reengineering educational methods must be carried out to meet future national and international learning demands

It is hoped that digital libraries can be used together with other educational materials bring about dramatic improvements at all levels of education. Digital libraries should be seen as an entity which will

educate our children and future generations with sufficient knowledge, skills and criteria. It should enrich our educational programs and enhance teaching methodologies.

The introduction of computer assisted learning for school children is the only way to overcome the technology gap between national and international educational systems. School libraries must be supplemented using the internet and digital libraries. The collaborative digital library is proposed as an aid to complement existing teaching methodologies. However, its successful usage is dependent on efforts to be made by all concern to collaborate. Teachers are a repository of knowledge and they are the contents provider within the collaborative digital library concept.

Reference

IBM DB2 Digital Library Archtecture. (1998). Located at: http://www~4.ibm.com/software/is/dig-lib/v2factsheet/page3.htm

Leiner, Barry. (1998). *The scope of the digital library : draft prepared for the Dlib Working Group on Digital Library Metrics,* January 16, 1998, revised October 15, 1998. Available at : http://www.dlib.org/metrics/public/papers/dig-lib-scope.html

Masullo, Miriam J. (1996). *Infrastructure, education and digital libraries : the roads of civilization.* Paper presented at Conference on Computers and Advanced Technologies in Education, Cairo, Eqypt, March 18-20, 1996. Available at : http://ianrwww.unl.edu/eduport/R-CATE96.HTM (25 Augist 2001)

Masullo, Miriam J. and Robert Mack. (1996). Roles for digital libraries in K-12 education. *D-Lib Magazine*, September.
Available at : http://www.dlib.org/dlib/september96/eduport/09masullo.html (25 August 2001)

Mendel, Jerry M. (1999). Education using digital libraries. Available at: http://www.itri.loyola.edu/digilibs/03_01.htm (14 August 2002)

Telekom Malaysia Group. (2002). *Reinventing education for the future*. Kuala Lumpur : TSS.

Transforming the concept of the Smart School into a reality. (2002). *MSC.comm*, Vol.4, no. 2.

Wainwright, Eric. (1996). *Digital libraries : some implications for government and education from the Australian development experience*. Available at : http://www.nla.gov.au/nla/staffpaper/ew6.html (14 August 2002)

Wallace, R., J. Krajcik, and E. Soloway. (1996). Digital libraries in the science classroom. *D-Lib Magazine*, September.

Zainab A.N, Abrizah Abdullah, Ng.W.K. (2002). *Collaboratively Building Digital Libraries: Focus on Local Historical Resources for Educational Use*. A paper presented at the International Association of School Libraianship (IASL) Conference in Petaling Jaya, Malaysia (5-9August 2000)