CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

A literature review was an account of what had been published on a topic by accredited scholars and researchers, a piece of discursive prose (Taylor, 2006) and explaining the intellectual progression of the field including major debates (Anson and Schwegler, 2000). Literature review might present the historical perspective, initial development and the current situation, possibilities of new inventions, including problems and issues raised, arguments discussed, strengths and weaknesses, to enhance knowledge, sharpens understanding and broadens researchers' perspective on that topic.

This chapter consists of literature review related to digital library initiatives worldwide, at national, regional and international levels. Secondary data were searched from print and online resources. Literatures on Malaysian digital library initiatives were very limited, but foreign literatures were plenty and some of these had been highlighted for us to peruse and emulate. Several Malaysian digital library initiatives were also looked at and reported.

2.1.1   Purpose and Approach to Literature Review

The purpose of literature review was to establish the potential topics and suggest ideas for another research, reporting published materials on existing conceptual framework, theories, techniques, processes, styles and instruments of other researchers related to the topic under investigation. At the same time to identify why some of the

literature was noteworthy and which literature had made important theoretical contributions to the field being studied (Anderson and Kanuka, 2003). It helped align our scope of study and in determining the various variables to be included. As for this research, the main purpose of literature review was to grasp comprehensive ideas on the extent of digital library initiatives and projects that had taken place worldwide and the factors and conditions that had influenced and contributed to their success.

The approach to literature review was the browse method where print and electronic sources were looked at, read and digested, looking for some relevancy, appropriateness and usefulness of the topic at hand. Browsing the printed materials – books, periodicals, journals, conference papers, annual reports, newsletter, newspapers and theses, would strengthen and reinforce the researcher's foundation of the subject matter. The used of information retrieval tools such as OPAC, abstracts, indexes and bibliographies allowed greater insight of the subject in a more organized manner. Among the online databases and e-journals searched were LISA, Emerald, Ebsco Host, D-Lib Magazine, Libri, Ariadne and the websites/homepages of many foreign digital libraries.

Predetermined keywords used during the search were digital library, virtual library, e-library, hybrid library, digital library initiatives, digital library problems, digital library research, digital services, digital reference, resource sharing, distributed information resources, Intellectual Property Rights, digitization, online databases, dematerialization, born digital materials, information surrogates, digital objects, information revolution, library automation, library systems, hybrid library, cyberian, information professionals, digital librarian, global access, repositories and interoperability.

As the research involved qualitative data as well, the researcher made a lot of efforts at the initial stage of the research making enquiries to get as much primary data as possible from as many librarians as possible whenever there were opportunities, to understand the subject better and helped in the formulation of the research questions.

The literature review was organized into three main sections namely Introduction, Development of Digital Libraries and Factors/Conditions Influencing Growth of Digital Libraries. The section on Development of Digital Libraries was further divided into sub-topics on i) Introduction ii) Digital Library Initiatives Worldwide (including Malaysia) iii) Research on digital library iv) Digital library related problems v) Library collections, operations and services vi) Training vii) Budget and viii) Opinions of Information Professionals. The chapter ended with Summary from Literature, Framework of Study and Conclusion.

2.2   Development of Digital Libraries

2.2.1   Introduction

From OPAC to portals (Secker, 2004). Perhaps this phrase might reflect the degree of digital library developments that had resulted from automation because Online Public Access Catalogue (OPAC) was the earliest product of such development. As we would see in the following segments, the progress was growing at an unprecedented rate, looking at the many digital library initiatives that were taking place in many countries around the world. However Borgman (2000) had cautioned that if global infrastructure could link together electronic resources, whether public or private, large or small, located around the world, would it serve as a global digital library? Similarly, Joint Information

System Committee, United Kingdom had launched a new website *Libraries of the Future* and the essential question was summarized as follows: *In information world in which Google apparently was offering us everything, what place was there for the traditional, or even the Digital Library?* (D-Lib Magazine, Vol.14, no.5/6, May-June 2008). Despite the above notions of uncertainties, digital libraries were being developed worldwide and the extent of which as exemplified by the following examples:-

Germany's VD17 project involved digitization of the important 17th century prints (Brahms, 2001). France's *Gallica,* was offering 90,000 volumes in image format, 1200 volumes in searchable text format, 500 sound recordings and 80,000 digitized still images (http://www.bnf.fr/pages/zNavigat/fraem/version_anglaise.htm?ancre=english.htm) as of April 2006. The Koninklijke Bibliotheek, the National Library of the Netherlands was planning mass digitization from 2007 – 2011, of the project Digital Daily Newspapers, that would digitize and put online 8 million pages from a selection of national, regional, local and colonial Dutch daily newspapers. As noted by Klijn (2008) that an increasing number of large scale newspaper digitization projects in Austria, Australia, Belgium, Finland, Chile, Sweden, New Zealand and the United States had emerged. There was also focus on national portals such as the French offering *culture.fr* (http://www.culture.fr/) and Italy's *Cultura Italiana* (http://www.culturaitalia.it/) (Dunning, 2007). The European digital library, *Europeana,* started in July 2007 had initially 2 million digital collections of texts, images, audio files and movies and the number was projected to reach 6 million items by 2010 (Landon, 2009). Meanwhile the Portal of the Association of Computing Machinery had 54,000 online articles from 30 journals it ever published (http://portal.acm.org/dl.cfm).

The American Library Association had reported in its annual report 2007 that the investment in e-books at academic and research libraries rose an astonishing 68% from 2002 to 2004. According to a June 21, 2007 *Amazon.com press releas*e, it planned to digitize thousands of books through agreements with universities and public libraries. An article in *The Chronicle of Higher Education* reported that Google too had signed a book digitization agreement with 25 universities with the Committee on Institutional Cooperation (Wilson, 2007). The climax to these developments was when UNESCO, Library of Congress and Google joined forces to build the *World Digital Library* (UNESCO, 2007) that was finally launched on 21 April 2009, offering information resources from all over the world, in 7 languages from 32 partner institutions (www.worlddigitallibrary.org).

2.2.2   Digital Library Initiatives Worldwide

2.2.2.1 Digital Library Initiatives by International Organizations

According to Sugimoto (2001) there had been many international collaborative activities for digital library initiative purposes and digital libraries were inherently international (Griffin, 1998) and became far more important nationally and internationally in 2003 than they were in 1996 and many new and significant digital library initiatives had emerged (Chen and Zhou, 2005). Even with little funding, a large international digital library had emerged, grown and improved (Fox, et al. 2004; Fox, et al. 2005).

National libraries of G7 countries had collaboratively created the *Bibliotheca Universalis,* thus establishing a global e-library system and the national libraries of

Belgium, the Czech Republic, the Netherlands, Portugal, Spain and Switzerland had since joined the project (Raitt, 2000). European national libraries' *IMESH* (http://wwwukoln.ac.uk/matedata/imesh-toolkit/) was another international collaboration on Internet subject gateways. UNESCO's *Memory of the World* (http://www.unesco.org/webworld/mdm/en/index_mdm.html) was one of the many successful digital initiatives (Hughes, 2004) and by 2003 some 68 projects from 40 countries were included in the *Memory of the World Register* (Tedd and Large, 2005). Together with International Federation of Library Association, it had also commissioned a Survey on Preservation and Digitization (www.ifla.org/VI/2/p1/miscel.htm).

The World Bank had established its e-Library service in 2003 (http://www.worldbank.org/elibrary) making the full text of its reports, documents and books available online (Tedd and Large, 2005). The European Union too had taken several steps at promoting digital library initiatives at European level with many projects such as CANDLE, CECUP, DEBORA,DECOMATEII (Collier,2004), DIEPER's, EULER, NEDLIB, DIGICULT and MIRACLE (Liu, 2005). CASPAR was another European Union integrated project with cooperation from UNESCO, University of Leeds, University of Glasgow and International Business Machine (Giaretta, 2006).

Klijn and de Lusenet (2000) discussed many European libraries that were embarking on the digitization of photographs and the European Commission on Preservation and Access had set up the SEPIA (Safeguarding European Photographic Images for Access) Project, which was funded by the European Union to investigate ways of safeguarding photographic collections (www.know.ul/wcpa/sepia/). However the European Commission's most ambitious digital library initiative under the EU's i2010

strategy, aimed to make over the next 5 years, 6 million resources accessible through the European Digital Library web portal (Dempsey, 2006). This figure could be much higher as by 2010, potentially every library, archive and museum in Europe would be able to link to its digital contents to the European Digital Library infrastructure and the projects list showed that they were working on 24 projects (i2010: Digital libraries, 2006). As reiterated by Forster (2006), European Commission's efforts and cooperation between Europe's national libraries in 2006, would see digitized objects increasing from 2 million in 2008 to 6 million in 2010. Another European Commission's funded project, COINE (Cultural Objects in Networked Environments) was completed in 2005 allowing the ordinary citizen to create, share and use cultural materials among communities (Butters, Hulme and Brophy, 2007).

In response to the European Commission's Digital Library Initiative, Conference of European National Librarians submitted a proposal under the *eContentplus Program* for the inclusion of all national libraries of the European Union into the European Digital Library Project. By 2007 the collections of the national libraries from Belgium, Greece, Iceland, Ireland, Spain, Sweden and Norway were integrated into the European Digital Library, a one-stop shop for Europe's cultural heritage (Dunning, 2007).

In 2000 six of the world's biggest learning and cultural institutions launched the *fathom.com* (http://www.fathom.com/) a global joint venture between the British Library, British Museum, Cambridge University Press, London School of Economics, Smithsonian Institute, Columbia University, University of Chicago and New York Public Library (Lesk, 2004). The philosophy behind *fathom.com* was that what's free in the real world would be free in virtual world. Even though Fathom website ceased operations in

March 2003, but the concept of a digital library and universal access continued through Fathom archive that was available at Columbia University (www.columbia.edu) and from the members of the Fathom consortium at their own websites.

Computer companies too were taking similar steps. Hewlett-Packard Digital Library was launched in 1992, thus expanding services for the 126,000 HP employees in more than 150 countries. Compaq Computer Corporation's Digital Library *WebLibrary* had created a collection of more than 1.2 million fully indexed online documents and successfully fulfilled the mission of a digital library that managed information throughout an organization and had increased the usage and accessibility of information via one stop center (Pack, 2000).

The extent of digitization of world treasures with the ultimate aim to be shared globally was one of the main reasons of the digital library initiatives done by many international organizations as manifested above. Subsequently in 1996, Keio University, Japan embarked on the HUMI Project, an ambitious program to capture digital facsimiles of Gutenberg Bible, digitizing 6 copies i.e. the Keio copy, 2 copies at the Gutenberg Museum in Mainz, 2 copies at the British Library and 1 copy in Cambridge University Library (www.keio.ac.jp/). Similarly, the British based International Dunhuang Project (http://idp.bl.uk/) was an international collaborative effort to catalog, conserve and encourage research of the Silk Road artifacts (Qian, 2005). The project had proven that the once dispersed collection of the legacy of the Chinese Buddhist monks of the 5 – 11th century had been re-united virtually and creating a true virtual library of one of the world's most significant cultural spaces (Deegan and Tanner, 2002).

The makings of digital libraries had reinforced international collaborations more than ever. As an example, the China - US Million Book Digital Library Project, (http://www.ulib.org) a collection of one million books, with a half million Chinese and a half million English, available to everyone over the Internet (Reddy and St. Clair, 2003). As of December 2007, more than 1.5 million books had been scanned in 20 languages (Wikipedia, 2007). *Chinese Memory Net* was another US-SINO collaborative research between partners in the United States, Taiwan and China working toward an effective and sustainable global digital library in Chinese studies (Chen, 2000). Then the Cuneiform Digital Library Initiative, a joint project of the University of California, LA and the Max Planck Institute, Berlin, funded by the National Science Foundation and National Endowment for the Humanities. The project saw the completion of the digitization of the early cuneiform collections available at several of the museums of the world. With funding again from the National Endowment for the Humanities and the Institute of Museum Library Services (2004-2006), the Cuneiform Digital Library Initiative continued to implement scalable access systems for worldwide users (http://cdli.ucla.edu/)

Hughes (2004) listed numerous international digital library collaborations such as the African Online Digital Library (http://www.africandl.org./), which was an American/African partnership and West African Digital Library Network (WADiLiN), (www.warc-croa.org/main.htm) an American/Senegalese partnership. The multilingual Tibetan and Himalayan Digital Library (http://www.thdl.org) was developed at the University of Virginia, United States as an international archive of knowledge about Tibet and Himalayas (Germano, 2002). Another effort by the International Council of

Museums, Virtual Library Museum pages – VLmp (http://icom.museum/vlmp/) was a distributed directory of museums around the world with digital collections. It was interesting to note that the visit to the physical museums had increased following searching and browsing of their digital collections (Tedd and Large, 2005). He also reiterated that the Networked Digital Library Theses and Dissertations (http://www.ndltd.org) had spearheaded the development of electronic thesis and dissertation in many countries.

There had been numerous ongoing initiatives developing tools and architecture for institutional repositories and digital libraries (Hughes, 2004). *DSpace* (www.dspace.org/) an open source dynamic repository (Smith, 2003) developed by MIT Libraries and FEDORA (Flexible Extensible Digital Object and Repository Architecture) project (www.fedoraproject.org/) (Dunn, 2004) developed by Universities of Cornell and Virginia were examples. DRIVER (Digital Repository Infrastructure Vision for European Research) was a European Union funded European digital repositories and due to the availability of funding, DRIVER II commenced at the end of 2007 (Feijen, 2007). The DRIVER Inventory Study was also underway to determine the current state of digital repositories in the 27 European countries of the European Union (Van Der Graaf, 2007).

The above digital library initiatives were mostly government funded projects or done by non-profit organizations. On the contrary, online services developed by Google, through its *Google Publisher, Google Scholar* and *Google Book Search* had resulted in different perceptions among librarians. Some perceived it as a threat to some of the library functions. Their worries were not baseless. Libraries were selections, defined by what they excluded, though we rarely stated what that was. Google is universal in a way

even our most universal libraries had never been. *Google Book Search Program* had set out about digitizing millions of books from five of the world's top libraries – Stanford, Harvard, Oxford, Michigan and New York Public Library. Google too was planning to rent out online books – a one week loan for one-tenth of the book purchase price (http://blog.searchenginewatch.com/blog/051114-104612). So librarians would have to act accordingly in response to such new forthcoming phenomena.

2.2.2.2 Digital Library Initiatives in Selected Countries

What follows next were glimpses of some of the digital library initiatives in eight countries worldwide: Australia, Canada, China, New Zealand, Singapore, Taiwan, United Kingdom and Unites States. Australia was noted for having developed many digital library initiatives. Canada had manifested a good collaboration between libraries, archives and museums. New Zealand is well known for its *Greenstone* digital library software. The United Kingdom and the United States were among the pioneers, trend setter and main digital library players. Liu (2005) supported this when he said generally speaking all over the world the pioneering digital library initiatives took place in the United States. And according to Andrews and Law (2004) the projects undertaken under the auspices of the United Kingdom and the United States had a fundamental impact on the development of digital libraries we saw today. Meanwhile, China, Singapore and Taiwan represented some of the digital library developments in Asian countries.

From the literature review that follows, we could see briefly the extent these countries went about developing their digital library initiatives, including when and how they got started, the important elements of success were highlighted, including some of

the conditions/factors that had influenced their growth and observed how collaboratively digital library initiatives came into being. This sub-topic ended with some insights on digital library initiatives in Malaysia.

AUSTRALIA

Australian libraries at the federal, state and university levels, together with commercial and research organizations were supporting diverse set of digital library projects (Iannella, 1996). Over the past ten years, it had seen steady growth in research and development in digital library initiatives (Hunter, 2006). Many notable digital library initiatives had been successful, some of which were spearheaded by the National Library of Australia as early as 1996.

The National Library of Australia's digital library initiatives were done under five strategies. First was the long-term access to digital information where PANDORA (Preserving and Accessing Networked Documentary Resources of Australia) was the national role model, based on an archive management system called PANDAS (Pandora Digital Archiving System), where the State Library of Victoria, State Library of South Australia, Library and Information Service of Western Australia and ScreenSound Australia were full partners (http://pandora.nla.gov.au). Second was the digitization program. Third was providing digital access to the library's collection through various projects, such as Rare Maps, Digitization of Oral History Audio Recordings, Endeavor, Captain Cook's Journal 1768-71 and Papers of Sir Edmund Barton. Fourth was the Federated Resource Discovery where the *Picture Australian* project had been initiated. Fifth was facilitating a greater understanding of digital library issues, where through

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PADI (Preserving Access to Digital Information), the National Library of Australia was developing a single source of current national and international information covering all issues in relation to the preservation of digital information (http://www.nla.gov.au/padi).

Australian universities too had been active in digitizing efforts. Four of West Australian universities - Edith Cowan, Murdoch, Curtin and University of Western Australia combined to establish the Indian Ocean Rim Virtual Library Project (http://www.cowan.edu.au/library/iorr/home.htm). Sydney University had developed the Scholarly Electronic Text and Image Service (SETIS), a digital library of humanities databases and theses (Chowdhury and Chowdhury, 2003). Electronic Reserve Project was the virtual library for Monash University Library's new branch on the Berwick campus (http://www.lib.monash.edu.au/wwwlib/). REDD – an Electronic Document Delivery Project, developed by the University of Queensland, Queensland University of Technology and Griffith University Libraries, had been used by staff and students of eight institutions (http://lib83.library.uq.oz.au/) (Ianella, 1996).

Seven institutions led by University of New South Wales on the other hand began collaborating in 1998/99 to accept electronic theses as part of the Australian Digital Theses Project (http://adt.caul.edu.au/), leading to a national program under the auspices of the National Library of Australia (Fox, 2004). Adelaide University Electronic Texts Collection consisted of more than 700 e-texts that included classic works of literature. Australian National University E-Print Repository had over 2460 items as of May 2005. Australian e-Humanities Gateway, a collaborative effort between ARC, University of Sydney, Australian Academy of the Humanities and University of Newcastle presented the best portal for digital resources in humanities disciplines in Australia. Curtin

University of Technology Institutional Repository had 260 items pertaining to research done by their staff and post graduate students. Set up in 2002, eprints@UQ was the University of Queensland digital repository, covering materials created since 1983. Monash University *ePrint Repository* showcased and archives quality research output of the university staff. As of May 2005, it held 122 e-prints covering the period 1996-2004 (http://www.e-book.com.au/freebooks.htm#1)

Project Gutenberg of Australia produced e-books and made them freely available online. It was interesting to note that some of the e-books available here might still be under copyright in the United States. One of the recent digital library project was PILIN (Persistent Identifier Linking Infrastructure), funded from 2006-2008 to strengthen Australia's ability to use global persistent identifier infrastructure particularly in the repository domain (Nicholas, Ward and Blinco, 2009). Australian public libraries through the Council Libraries were moving ahead with Sydney's first drive–through library, operational in September 2000, offering online reservations and drop off books (D'Costa, 2000). Cyber libraries and a 24-hour ordering system had been designed to cater for online services and many councils had started an integrated virtual library system.

To monitor the country's digital library initiatives, a web site *Australian Libraries Gateway: Australian Digitization Projects,* containing information about its digitization initiatives (http://www.nla.gov.au/libraries/digitisation) was maintained. The latest development that related to digital books as reported in the newspaper recently was that digital books would be available for purchase over the counter at bookstores from the first half of 2010 via participating bookstores, using new technology designed for Australian publishers (The West Australian, October 19, 2009, p.14).

It could be said that Australia had been aggressive in its digital library initiatives. Collaboratively, the key players – federal and state governments, state councils, the National Library of Australia, university libraries, commercial and research organizations had played huge roles. Free digital libraries were developed with the best strategies, supported by monitoring system, availability of financial support, developing role model and the creation of a single information center on the preservation of digital information. Many university libraries' had developed repositories and persistent identifier linking infrastructure, enabling Australia to be the role model for other countries to follow suit.

CANADA

Canada's early attempt towards digital library development could be traced back in 1993–1994 when a national working group developed Canadian Information Resource Sharing Strategy (CIRSS). The National Library of Canada, now known as Library and Archives Canada had worked in partnership with the Canadian community for many years to develop and implement a technical, service and policy infrastructure for resource sharing at national level, involving several task forces. For example Canada Task Force on Digitization, Government Online Task Force and Digital Library Task Force (http://www.nlc-bnc.ca/cidl/cidle.html).

For most countries, it was their national libraries that would take the leading role in initiating digital library program but in Canada, it was the Canadian Initiative on Digital Libraries (CIDL). With a membership of more than 50 Canadian libraries of all types, CIDL promoted, coordinated and facilitated the development of Canadian digital collections and services in order to optimize national interoperability and long-term

access to Canadian digital library resources. Began in 2000 when they first did the CIDL Membership Survey, they had progressed steadily. As of October 2005, the inventory contained 309 projects from 360 Canadian organizations. Libraries represented 49%, archives 25%, museums 9%, galleries, publishers and associations made up the balance. As for project funding, 33% were Federal, 16% were Municipal, 15% were university / college, 11% were provincial, and 25% were member organizations, donors and business (CIDL News, No. 12, February 2006). With some funding from the Heritage Canada Partnerships Program, CIDL had worked on several projects with University of Calgary Press, mostly related to publish Canadian local histories. One of the Heritage Digitization Project, the most successful endeavors was *Our Future, Our Past: the Alberta* (http://www.ourfutureourpast.ca) (Tedd and Large, 2005).

Canada's central approach towards digitization was through digital production centers and had emphasized on digitizing Canada's heritage. Laval University's Library and Press had obtained a grant from the 'Fonds de l'autoroute de l'Information' to establish digital production centers in Montreal and Quebec. It was also involved in *Early Canadiana Online* (http://www.canadiana.org/eco.php?doc=home) one of the largest projects of this kind in Canada, providing access to 2.6 million pages, as at November 2007 of Canada's printed heritage. *Early Canadiana Online* was now produced by Canadiana.org, and it was stated on the website that as at 29 Mac 2007, Ancestry.ca partners with Canadiana.org to bring online nearly 300 years of early Canadian historical documents. It was also leading in the *Our Root Project 2006* and intended to digitize 150,000 pages of Marcotte Directories of Quebec.

Another good example was The Southern Alberta Information Resources Project (SAIR) (http://www.sadl.uleth.ca/gsdl/cgi-bin/library?a=p&p=about&c=SAIR) 2003 – 2006 that was an important step in the development of Alberta Digital Library and to preserve Alberta's past and more importantly, its present – for future generations to study and appreciate (Crewdson, 2006). The Lois Hole Campus Alberta Digital Library had won the 2008 Canadian Association of College and University Libraries' Innovation Achievement Award due to its truly innovative concept that had pushed consortia activity to a new level and might in fact serve as a model of collaboration for other provinces (http://www.lhcadl.ca/). On the other hand, OCLC Canada was working with the Manitoba Library Consortium to digitize over 122,000 pages of historically significant newspapers and atlas, books and historic maps. Began in October 2004, the project was possible when Canadian Heritage granted a Partnership Fund via the Canadian Culture Online Program to the Manitoba Library Consortium.

As in Australia, Canadian universities too played active roles. The University of Alberta Libraries' Personal Digital Assistant Service was integrating services and resources into library collections. Began in 2001, this services was the result of a noted increase of users with PDA's (Koufogiannakis, Ryan and Dahl, 2004). University of Waterloo Electronic Theses Project aimed to build an e-theses and dissertation submission and access system that provided unrestricted web access to a growing number of university's theses and dissertations. Although facing some problems like copyright and Intellectual Property Rights issues, the databases provided open access to more than 500 Electronic Thesis and Dissertations (Jewell, Oldfield and Reeves, 2006). The Canadian Association of Research Libraries began an institutional repository project in

2003, representing 27 university libraries in Canada plus CISTI, the Library of Parliament and Library and Archives Canada. Based on open access, the number of working repositories had grown from 4 in 2004 to 9 in 2005 (Shearer, 2006).

On the other hand, Federal Science eLibrary was an initiative supported by the Strategic Alliance of Federal Science and Technology Libraries to provide improved access to information at the desktop for 22,000 Canadian federal scientists, policy analysts and decision makers. Started in November 2005- January 2006, the project had proven that researchers benefited significantly from expanded access to e-journals at their desktops (Brown, Found and McConnel, 2007). Toronto Public Library, which is the largest public library system in Canada, had started the Virtual Reference Librarian, made possible through the collaborative efforts of TPL, the TPL Foundation, Telecommunications Access Partnerships, Ontario Ministry of Energy, Science and Technology, and the Ontario Ministry of Citizenship, Culture and Creation. Toronto Public Library loaned over 25 million items and answered 8 million reference questions a year (http://vrl.torontopubliclibrary.ca/vrl.portal).

As what had been practiced by Australia and New Zealand, Canada too maintained a website *Library and Archive Canada: Inventory of Canadian Digital Initiatives* (http://www.collectionscanada.ca/initiatives/index-e.html) that could give a glimpse of all the digital initiatives that were in the pipeline.

Some of the key elements for digital library growth in Canada had been the involvement of the Canadian community, universities and the national working group in the form of digital library task forces, innovative consortia efforts, digital production centers, monitoring system, well organized repository projects and implementing service

and policy infrastructure. The presence of a central body played a big role in coordinating and promoting to optimize national operability and funding that came from the federal government, municipal, universities, private donors and business organizations.

CHINA

China's digital library program started off with research projects, embedded within the National High Technology Research and Development Program, launched in 1986, managed by the Ministry of Science and Technology. Some of these were Strategic Research on the Development of Chinese Digital Libraries, Research on Characteristics-based Multimedia Information Retrieval System, Knowledge Network Digital Library System Project, and Chinese Digital Library Application System on China Advanced Info.Optic NET (CAINONET) (Liu, 2004).

In 1996 saw the development of the Chinese Pilot Digital Library project, undertook by nine public libraries and the National Central Library, with the aim to set up multimedia repositories, provided digital information services and developed e-commerce (Liu, 2004). Completed in 2001 and became the first digital library project in China and the first to give a solution to issues in developing digital library in the country. The National Central Library then launched in 1998 its www-based 'Remote Electronic Access / Delivery of Document Services' (http://readopac.ncl.edu.tw/eindex.html) or *READncl* enabling users to retrieve information via the Internet. *READncl* comprised more than 9 systems with over 1.5 million entries and 5 million pages of text images and linked to over 22,000 articles via the internet.

In 2002 another collaborative project was proposed to the Ministry of Science and Technology. Called Project Establishment of Standard and Specifications for Digital Library Construction (ESSDLC) (Liu, 2004), it was done with the National Science and Technology Library, National Central Library, China Academic Library and Information System (CALIS), and Beijing University Library, with the main goal to generate a series of national standards and specifications for the construction of digital library in China and one of these was the Chinese Metadata Standard produced in 2002 (Long and Ling, 2000).

The China National Digital Library Program of the National Central Library, which started as a pilot project in 1998 really took off in 2000 with the setting up of a national wide platform to enhance the access to digital repositories (Tseng, 1998). A consortium of 117 members was established in 2002 to collectively involve in the creation of digital repositories, the construction of digital library hardware and software, the development of application systems, the shaping of standards and specifications structure and training of professionals. Other offshoots were the National Culture Resource Sharing Project, the National Technological Library and Information Center and the Chinese National Science Digital Library. Main task of the Chinese National Science Digital Library was to build integrity information resources and management system all over the Chinese academia and to make digital library as an extension to every scientist's desktop in China.

China had since developed many digital libraries in different fields. China National Knowledge Infrastructure launched in June 2000 consists of China Periodical Network and China Major Newspaper's full text data bases created by Qinghua University. Tsinghua University Central Library had worked jointly with China Research Laboratory

and Yingzaoxueshe, a Chinese Institute to design and developed Tsinghua University Architecture Digital Library and it was the first internet based full function digital library system in China (http://www.lib.tsinghua.edu.cn/english/). The Chinese National Petroleum Corporation had developed Digital Library System to support oil exploration and production management data (http://www.chinapc.com/eng/cporg_cnpc.html). The digital library of the Chinese National Historical Maps was a joint research project between National Central Library and Fudan University, and had completed the initial multimedia which presented the national and regional geographical and historical information of the Qing and Ming Dynasties (http://www.fudan.edu.cn/englishnew/library/digital.html).

China's initial attempts were spearheaded by digital library research and development programs, through collaborative efforts of the national library, public and academic libraries and government ministries. The early emphasis was to generate a series of national digital library standards and specifications for the construction of digital library in China and also for document delivery service. The strength of the digital library consortium saw the creation of a national platform to enhance digital repositories, digital library software and hardware, and training. The success of China's digital library initiatives was manifested by the international collaboration it had with the United States through the China-US Million Book Project, with Carnegie Mellon University collaborating with a dozen of other Chinese universities.

NEW ZEALAND

The New Zealand Digital Library project, a research program at the Department of Computer Science, University of Waikato had developed in collaboration with UNESCO, *Greenstone* Digital Library Software (Witten and Bainbridge, 2003, 2005). As illustrated by Witten (2005) *Greenstone* was in widespread use in many corners of the world and as of October 2006, there were 28 sites using it (http://www.greenstone.org) and as of November 2009, the latest *Greenstone3* was still a research version (http://www.greenstone.org/greenstone3-home).

New Zealand digital library project had done a considerable amount of digitization works specifically to preserve the Maori culture. National Library of New Zealand had developed *Papers Past* web site containing 300,000 pages from the Alexander Turnbull Library, providing an insight into the social, political and economic happenings in the 19th century New Zealand (http://paperspast.natlib.gov.nz/). In June 2001, the *Rangiatea* Website was launched, featuring Church vestry – the oldest Maori Church that had been destroyed by fire in 1995, *Te Papa Tongarewa* and the *Niupepa* Collection (NZDL, 2004; Chern, 2005). The website was an expression of partnership between the National Library of New Zealand and the wealth of the Maori cultural heritage (http://rangiatea.natlib.govt.nz/).

Living Heritage Project, which was integrated with the classroom curriculum, was done in collaboration with 20/20 Communications Trust, to encourage schools to discover, research and record a treasure in their community, so that New Zealand's heritage was captured and preserved online (www.livingheritage.org.nz). In November 2005 the New Zealand National Library *Te Puna Mätauranga o Aotearoa* became the

Sun™ Centre of Excellence for Digital Futures. This achievement broke new ground in two important respects. Firstly, the New Zealand National Library was the first New Zealand organization to be named a Sun™ Centre of Excellence. Secondly, it was the first non-tertiary organization to achieve recognition in this way (Reid, 2006).

The New Zealand National Library had also collaborated with the British Library in developing the Web Curator Tool for managing selective web archiving (Paynter, 2008). To closely monitor the country's digital library initiatives, a web site *The New Zealand Register of Digitization Initiatives* (RoDI), containing basic information about digitization initiatives in New Zealand or that related to New Zealand topics (http://ndf.natlib.gov.nz/register/register.htm) was maintained. Archives New Zealand on the other hand was planning to undertake New Zealand's Digital Continuity Action Plan, considered to be the first world initiative, to prevent public records being lost and ensured that today's information would be available tomorrow (Clarke, 2009).

New Zealand had contributed tremendously to world's digital library development through the *Greenstone* software. With a monitoring system, it had demonstrated an effort to preserve digitally the Maori cultural heritage and had integrated the concept of digital library into schools.

SINGAPORE

Library development in Singapore had been well mapped out and the driving force behind it was the National Library Board, formed in 1995. In retrospect, Singapore's digital library development was spearheaded by the Library 2000 Committee, comprising of librarians as well as the Singapore National Computer Board, to establish Singapore as

an international information hub. The plan included a detailed rework of 500 libraries and information centers that would enable access to information from anywhere, at any time, within the next 20 years (Reid, 1996). In 1999, iGEMS (i-Gateway to Educational and Media Services), an Internet-based university portal was launched giving a number of digital library services to Nanyang Technological University (Chowdhury and Chowdhury, 2003).

Singapore–ONE Project, the initial digital library program, unveiled by the Ministry of Communications in 1997 might be considered as the ultimate attempt to connect all Singaporeans on one network. As part of the IT 2000 Master plan, the key elements among others was the building of world class National Information Infrastructure, aiming at providing a world-class library system that by the year 2001, the concept of e-citizen and e-government became a reality. Even though the time frame for *Singapore-ONE* was 15 years, but achieving this would not be a problem because as of 2001, Singapore had 60% PC and Internet penetration and over 300,000 broadband users.

In May 2000 *e-library* was launched, believed to be Asia's first fully electronic library, offered through 'e-station', a commercial online educational and an electronic edutainment center located in Suntec City, offerings an online e-book library that offers 16,000 titles through a tie-up with US-based netlibrary Incorporation, TiARA, the *Vegas* (Virtual Exhibition Gallery System) digital image databases and *InfoXpress*, a database on Singapore's history and culture (Quek, 2000; Wee 2000). Subsequently in April 2002, the *eLibraryHub* service was launched as part of the National Library Board's Digital Library system, done in collaboration with Shanghai Library in China that included document delivery services, a Chinese-English translation service and specialized

libraries of digital sources were being developed for niche markets (Tedd and Large, 2005). *eLibraryHub* included some 13,000 e-journals and online databases, 10,000 e-books and more than 700 CD-ROM and 900 video-on-demand titles. China Reserve Library was launched at the end of 2002 (Theng, 2005).

Singapore's digital initiatives success was marked by the strategic collaboration between the National Library Board, the National Computer Board, Library 2000 Committee and the Ministry of Communications. The well developed public libraries and the presence of the National Information Technology master plan together with the library national plans, and the national information infrastructure and broadband, had resulted in Singapore being a connected island and had accelerated the concept of e-government and e-citizen and in making Singapore as an international information hub. It had also successfully ventured into international digital library collaboration with China.

TAIWAN

Taiwan's early digital library initiatives could be traced back in 1997 when National Taiwan University initiated a metadata research project *ROSS* (http://lis.ntu.edu.tw) to study the existing metadata format in relating to databases and system framework (Chen and Chen, 2001). Several projects that had been completed were related to the digitization of Taiwanese cultural heritage; establishment of domestic research digital libraries; provision of foreign research digital libraries and integration of conventional and digital libraries.

Taiwan digital library initiatives were more concerned with their rich ancient cultural heritage and among the major institutions that were digitizing their collections

were the National Palace Museum, National Central Library, National Taiwan University and Academic Sinica (Chen, 2005; Ke and Hwang, 2000) (http://www.ndao.org.tw). For the preservation of Chinese and Taiwanese culture, the National Palace Digital Museums was known for its splendid collection of Chinese treasures and civilization such as the enamels from the Ming and Ching dynasties, the famous Album Leaves of the Sung Dynasty and Buddhist scriptures. It had gathered 400 volumes of Chinese scriptures and 154 leaves of Manchurian and Tibetan sutras since the Sung Dynasty (http://buddhism.lib.ntu.edu.tw/BLM)

The National Science Council Digital Museum was an inter-organizational program for establishing digital museums with Taiwanese and Chinese cultural content, supported by the National Science Council of the Taiwan government. The project witnessed interdisciplinary cooperation because the theme-based project necessitates that each theme project should at least consist of subject experts of the theme project's content, computer and multimedia technologist and scientists of library and information organization.

Digital library in Taiwan could be said to be hybrid in nature. Services were integrated between the traditional method and web-based services, encouraging patron's resource discovery in a diversity of formats. E–Inter Library Loan in Taiwan was quite developed. Without doubt, in a hybrid library, inter library loan and document delivery service, would continuously play an important role (Ke and Hwang, 2000).

In Taiwan, the efforts of two governmental information centers – Science and Technology Information Center and the National Central Library, together with CONCERT (Consortium on Core Electronic Resources in Taiwan) had paved the way for

aggressive national digital library development. May 2002 saw the birth of E-Taiwan Project by National Information and Communication Initiative as part of the so called *Challenge 2008,* the 6 year National Development Plan at a cost of NT$36.63 billion (Chiu, 2002) that included the National Digital Archives Program, the outputs of which were collected into Taiwan Digital Archives. The E-Taiwan Project was further supported by the M- Taiwan Project, an attempt to expand wireless networks, integration of mobile phone networks, setting up of optical-fiber backbones and the execution of the Integrated Beyond 3rd Generation (iB3G) Double Network Integration Plan (Chen, 2006).

Taiwan's digital library initiative was part of the national development plan and was initially triggered by a university's metadata project. It had since been doing many projects based on a specific digital library frame work, emphasizing on its rich cultural heritage. Preferring the hybrid type, most of the projects were very much inter-organizations and collaborations between inter-disciplinary experts were fully utilized, integrating traditional and digital libraries. Two government information centers and an effective consortium effort paved the way for digital library developments together with supports from the E-Taiwan and M-Taiwan projects.

UNITED KINGDOM

In the United Kingdom, early attempts towards library automation in the 1960's were the Birmingham Libraries Cooperative Mechanization Project (BLCMP) and South West Academic Libraries Cooperative Automation Project (SWALCAP) (Brophy, 2006). However digital library initiatives started in 2003 with the British Library's strategic objective which stated that by 2000 it would be a major center for the storage of and

access to the digital texts (Secker, 2004). Following the Follet Report, the electronic library program – *eLib* – was set up by the Joint Information Systems Committee (Follet, 1993), focusing mainly on the higher education sector (Pinfield, 2001).

In phases 1 and 2, 59 projects were funded in the areas of electronic publishing, image digitization, document delivery and access to networked resources (Rusbridge, 1998). Phase 3 launched in 1997, involving 21 organizations (Secker, 2004) was an attempt to build model digital libraries through four main approaches i.e. hybrid libraries, large scale resource discovery, digital preservation and the development of e-library projects. However, 7 years, 70 projects, *eLib* program came to close, but it was a success in becoming a model upon which future e-library research and development activity could be based, at least in the United Kingdom (Pinfield, 2004).

The British Library Digital Library Program's priorities were to provide improved access to the library's historical holdings through services to the worldwide research community, schools, communities and the general public; the expansion of its UK and international document supply services; the implementation of legal deposit to digital media; and to enable users to have full access to the complete range of materials in the library's collection, digital or otherwise. In September 2000, the British Library had completed a major procurement for the digital infrastructure environment, the Digital Library System – comprised two main elements – the Digital Storage Application and the Discovery and Retrieval Application.

United Kingdom's digital initiatives saw the digitization of many of their national heritage such as the British Library's Treasures Collection (Law, 2004), the digitization of the only known copies of the earliest books printed in Scotland – the Chepman and

Myllar Prints, published in about 1508 (http://www.nls.uk/firstscottishbooks/),and the last letter written by Mary, Queen of Scots in 1587 (http://englishhistory.net/tudor/maryqos-letter.html). Other attempts included the works of John Thompson, Scotland's most important photographers; World War 1 documents from Earl Haig's papers; and Churchill Archives Center, virtual exhibition of key documents and photographs from the Churchill papers (http://www.chu.cam.ac.uk/archives/) and the Digital Shikshapatri Project, treasures of Hinduism ever been available online. This was a joint cooperative project of the Indian Institute Library, the Refugee Studies Center at Oxford University and The Oxford Center for Vaishnav and Hindu studies (www.shikshapatri.org/). Funded by the United Kingdom's New Opportunities Fund, it was one project in the World Cultures Consortium of Digital Projects that was seeking to make the cultural richness of a number of Diasporas communities in Britain more widely available.

In 2001, the British Library Newspaper Library (www.bl.uk/collections/newspaper/) together with OCLC Preservation Resources, the Malibu Hybrid Library Project at King's College London and Olive Software produced a prototype system for the digitization, indexing and presentation of historic newspaper. On the other hand the *ASPECT Project* (http://gdl.cdlr.strath.ac.uk/aspect/) was set up to create a digital archive of the ephemera, produced by candidates and political parties for the 1st Scottish parliamentary election in May1999 (Law, 2004). The National Archives (http://www.nationalarchives.gov.uk/) too had done digitization works and had brought together the collections of the Public Record Office and the Historical Manuscripts Commission to form one of the largest archival collections in the world, spanning 1000 years of the British history (Tedd and Large, 2005).

British Council, UK with branches all over the world had embarked on a massive virtual library concept through *The Distance Learning Zones* concept in 2000, enabling trans-national distance learners in multiple locations worldwide, enrolled in postgraduate courses to have access to e-books/e-journals anywhere, anytime. The British Council in Malaysia, with branches in Kuala Lumpur and Penang was operating its e-library, claimed to be the first of its kind in the country, providing access to over 20 global databases valued at over RM800, 000.00 (Louis, 2002) (www.britishcouncil.org.my)

As could be seen, British Library's digital efforts started with automation, first with the higher education sector and were accelerated by its strategic objectives, a national official report on the need for electronic library, setting up priorities, creating a digital library model, procurement for digital library infrastructure and developing a prototype system. Together with the National Archive, digitizing programs had been enormous with an emphasis on global access, cultural heritage and promoting distance education.

UNITED STATES

Digital library move in the United States began in 1989 by the Library of Congress when a consultant surveyed 101 members of the Association of Research Libraries and the 51 state library agencies, disclosing genuine needs for online collections. The United States federal government responded by spearheading Digital Library Initiatives 1 (1994-1998) and 2 (1999-2004), that dramatically changed the country's digital library scenario. Defense Advanced Research Projects Agency (DARPA), National Aeronautics and Space Administration (NASA), National Science

Foundation (NSF), National Library of Medicine (NLM), National Endowment for the Humanities (NEH) too played their roles in terms of giving digital library research grants (Mischo, 2004).

The Library of Congress National Digital Library Program was launched in 1995, after a 5-year pilot (1990-1995) of the American Memory Project, working with the National Science Foundation, universities, foundations, publishers, museums and educational bodies. It began digitizing collections of Library of Congress archival materials that chronicle the nation's rich cultural heritage (http://memory.loc.gov/ammem/index.html). They planned to present online 5 million items in 5 years (Kresh, 2004) and reached its goal of digitizing 5 million items in its bicentennial year of 2000 (Library of Congress, 1998). Even though the American Memory Project had successfully digitized 9 million historical images as at June 2007, this represented a mere fraction of more than 120 million items in its inventory.

Academic libraries too were rapidly developing their own digital libraries. California Digital Library system developed in 1997 was a result of a 3-year planning process, which culminated in the establishment of Library Planning and Action Initiative (http://www.lpai.ucop.edu/) (Chowdhury and Chowdhury, 2003), allowing the University of California's nine campuses to more than 10 million unique titles representing over 15 million holdings (http://www.cdlib.org). Western Michigan University on the other hand began delving heavily into electronic serials in 1997/1998 with the purchase of e-serials management software, *TDNet* in 2001. The prototype was operational in summer 2002 and the site went alive in August 2002 (Gedeon and Boston, 2004) (http://www.wmich.edu/library/articles/journals.php/).

The Virtual Library of Virginia (VIVA) (http://www.vivalib.org/) was a consortium of Virginia's academic libraries established in 1993, funded by State Council of Higher Education of Virginia. The Indiana University Digital Library Program was a collaborative effort of the Indiana universities libraries, the office of the VC for Information Technology and the University Research Faculty with the leadership from the School of Library and Information Science (Dunn, 2004). The Alabama Virtual Library (http://www.avl.lib.al.us/) was initiated by Network of Alabama Academic Libraries, Alabama Department of Education, Alabama Department of Post Secondary Education, Alabama Public Library Service and the Alabama Supercomputer Authority. The initial roll out of the Alabama Virtual Library was to the schools, campuses and libraries, then to all citizens. Due to its success, Alabama was chosen as the pilot program for the United States library program administered by the Bill and Belinda Gates Foundation.

Columbia University had completed a digital library project *Bartleby,* (http://www.columbia.edu/cu/lweb/digital/collections) the content of which was about literature based on published texts. Carnegie Melon University developed *Informedia*, (http://www.informedia.cs.cmu.edu/) centered upon entertainment, education, sports and training based on video, audio, images and texts. University of California at San Francisco was proud with its *Red Saga Project,* focusing on the subject of biomedical, based solely on published clinical journals. University of Kansas's Vision Digital Video Library System, which was multidisciplinary, was digitization of its videos collection. University of Maryland and the Internet Archive, with funding from the National Science Foundation had developed for free the International Children's Digital Library

(www.icdlbooks.org) that would make available to children around the world, a collection of international literature (Kresh, 2004). Operational in June 2003, it started off with 200 titles from more than 27 cultures in more than 15 different languages

Besides the academic libraries, other organizations with diverse background had also been active in pursuing digital library development. The Michigan Community Health Electronic Library was created as part of a plan to migrate the state's five print health library resources to a virtual 'mostly digital' library available to health authorities across the state, working with OCLC and Gale Health and Wellness Resource Center (Brenneise, 2004). This project had been expanded by Clinical Digital Libraries Project and Michigan *eLibrary*. In Kentucky, digital library initiatives started in 1996, when the Kentucky Commission on Higher Education Institutional Efficiency and Cooperation recommended the establishment of a statewide e-library as part of the planning for Kentucky Virtual University. Kentucky Virtual University and Kentucky Virtual Library, opened in October 1999, had been developed concurrently. As at December 2000, 1432 Kentucky libraries were members of the Kentucky Virtual Library user community, representing a total user base to almost 2.6 million. Due to its success, Kentucky Virtual Library received the Multitype Library Cooperation Award as Outstanding Library program of the Southeast from the Southeastern Library network (SOLINET) in May 2001 (http://www.kyvl.org/)

United States digital library development had gone beyond the normal boundary when the National Institutes of Health, the National Library of Medicine, the Department of Health and Human Services and the National Institute on Aging developed *NIHSeniorHealth* (http://nihseniorhealth.gov), a digital library of health information

sources to older people (60 plus) with a spoken word version also available (Tedd and Large, 2005). The United States National Science Foundation initiated The National Science Technology, Engineering and Mathematics (STEM) Education Digital library and over 100 projects had made up this initiative, engaged in targeted research, services development and deployment in supporting varied communities with specialized collections (Arms, 2002). The New York Public Library (www.nypl.org) on the other hand had digitized some of its local collections, such as the famous Lewis Wickes Hine photographs of the construction of the Empire State Building 1930 – 1931.

Private companies too played a significant role in digital library development. In September 2000, netLibrary Inc., a division of OCLC, had teamed up with Fatbrain to develop *NetLibrary eBooks* and its digital rights management infrastructure had been adopted by hundreds of publishers of academic, reference, scholarly, textbooks, and trade books. It developed archives, hosted and securely distributed eBooks through a variety of channels, including universities and K-12 schools, public, and corporate libraries. (http://company.netlibrary.com/20000915.aspx?ekmensel=8_submenu_52_link_7).

The Library of Congress was noted for the success in leading, creating and developing the National Digital Library Program. Other than those discussed above, it too had implemented a virtual reference service, *QuestionPoint* developed together with OCLC and the library's own version *Ask a Librarian*. It had also begun archiving primary source materials, such as the MINERVA (Mapping the Internet Electronic resources Virtual Archive) (http://www.loc.gov/minerva) Project, Election 2000 and 2002 Project, September 11 Web Archive and 2002 Winter Olympics. The Library of Congress had been tasked by the United States Congress to create a national program to

preserve materials that had been created only in digital format. The National Digital Information Infrastructure and Preservation Program (http://www.digitalpreservation.gov/ndiipp/) would provide the policy, standards and the technical components necessary to preserve digital content (Kresh, 2004).

Not only within the country, Library of Congress had also expanded its wing and collaborated with two Russian national libraries in the creation of its first major international digital library project *Meeting of Frontiers* in 1999. It also launched similar partnerships with other national libraries – Brazil, France, the Netherlands, Spain and Egypt as the Library Global Gateway initiative (Campbell, 2006). The establishment of a National Digital Strategy Advisory Board in early 2001 and the overall strategy (LC21, 2000) would serve as guidelines in the planning process (Kresh, 2004).

Thus, digital library initiatives in the US began with the survey determining national digital needs across the country. The digital library programs spearheaded by the Library of Congress had been extensively characterized by collaborative efforts at all levels, partnering with many foreign organizations, federal partners and non-federal sector. The US Congress fully supports Library of Congress's digital library initiatives and grants were available from many different sources. The academic libraries too had been pro active together with some of the state and non-governmental organizations. The availability of national digital infrastructure and policies and digital advisory board, had helped further the planning process. The conducive environments together with a strong leadership had led to many digitization projects at all levels that went beyond the local boundaries as manifested by the launching of yet another of Library of Congress's international collaborative effort i.e. the *World Digital Library* in 2009.

The country by country analysis was an attempt to solicit the key conditions that had contributed to their digital library success. From the above discussions, several conditions that seemed to have influenced the success of digital library initiatives in those eight countries were:

a) Collaboration was at the forefront of all digital library projects. Mostly spearheaded by the respective national libraries, they collaborated with all types of libraries, archives, museums, schools, galleries, state and provincial governments, ministries, departments, consortia, private organizations, associations and foundations and community groups. Many of the digital library projects had been international.

b) Universities were at the forefront, actively and collaboratively developing digital libraries and doing digital library research through Digital Library Research Centers.

c) Well laid out digital library policies, setting up priorities, standards and specifications, digital advisory board, national information and knowledge infrastructures, work plans, directions, strategic planning, digital initiative inventory, monitoring system, IT Plan and long term library plan in an attempt to give long term virtual access to digital information.

d) Special task force or national working groups were established to do pilot projects and preliminary surveys, creating digital library model, developing prototype system, establishing digital production or scanning centers, and at the same time to promote, coordinate and facilitates such development.

e) Budgets were available either from the federal or state governments or in the form of grants, funding and donations from private organizations or foundations.

f) The subject coverage for digitization works was extensive, both local and beyond, emphasizing on preserving history and culture, local contents, rare materials and reaching out to the global community, thus emphasizing on the importance of inter-organizations, inter-state and inter-disciplinary collaborative efforts.

g) Digitization projects were tremendous covering both information surrogates and born digital materials and this had sparked off numerous avenues for discussions on digital library issues and on further digital library improvements.

2.2.2.3 Digital Library Initiatives in Malaysia

2.2.2.3.1 From *MALMARC* to *PERDANA*

Automation of Malaysian libraries began in 1978 with the *MALMARC* Project, a centralized batch processing system for copy cataloging, initiated by the National Library of Malaysia with 5 other local universities. The project was discontinued in 1990 with an output of a union catalog consisting of approximately 480,000 bibliographic records of the consortia libraries (Shahar Banun, 1994), because the early 1980's saw the rise of computer applications among Malaysian libraries and many were buying their own integrated library systems (Norkhayati, 1999). The National Library of Malaysia's first attempt to create a nationwide library networked environment was the *Jaringan Ilmu* Project in 1994, thus setting up the beginning of an initial concept of digital library between 14 Malaysian state public libraries and 31 selected ministerial and departmental

libraries. The provision of both software and hardware by the National Library of Malaysia together with training, telecommunication costs and Internet fees for the first year had facilitated the much needed infrastructure for networking and resource sharing facilities. The conceptualization and formation of NITA (National Information Technology Agenda) and Multimedia Super Corridor (MSC) in1996 helped to provide the framework for a coordinated and integrated approach to IT based application and multimedia industries. The formation of a National Committee on Master Plan on Multimedia Digital Libraries in 1997 (Norkhayati, 1999) had actually helped indirectly accelerated further Malaysian digital library development.

Having laid the basic digital foundation through networked environment for selected Malaysian libraries, the National Library of Malaysia continued developing digitization initiatives. *Connected Learning House* Project, a concept that was introduced by Bill Gates, was indeed a second phase of the *Jaringan Ilmu* Project and was officially launched on 27th May 1999. A joint venture between National Library of Malaysia, MIMOS, Microsoft (M) and Hewlett-Packard (M), it portrayed a stimulating, enriched and networked educational environment from continuous dynamic interaction between students, educators, parents and the extended community. The participants included 14 state libraries, Sultan Salahuddin Abdul Aziz Shah Secondary School, Standard and Industrial Research Institute of Malaysia (SIRIM), educators and parents.

With that background, it finally brought to the culmination of the first initial national digital library initiative/pilot project *PERDANA* in 1999-2000, what to the United State's initial digital library initiative the American Memory Project, United Kingdom's *eLib,* Spain's Memoria Hispanica, France's Gallica, German's Global Info,

Austria's Digital Image Archive (Liu, 2005) and Singapore's *eLibraryHub*. *PERDANA* Project was conceived as part of the Malaysian Multimedia Super Corridor initiatives, the goals of which were to provide access to information; supports life-long learning; information for all; enriches digital content; supports e-learning; develops competency in ICT; and provides framework and standards.

Implementation strategy of *PERDANA:*

       a) 1999 – 2000 Pilot project *PERDANA.*

       b) 2001 – 2005 Training in metadata creation, standards, search engines, user education programs, research and development, smart card, policies.

       c) 2006 – 2010 Continuation of the past projects.

       d) 2011 – 2015 Maintaining special servers for local publications and the use of smart card.

As of September 2008 only Mylib (http://www.mylib.com.my), a small version of *PERDANA* had taken off the ground, done in collaboration with PERPUN, selected government libraries and state public libraries. Acting as a portal to market Malaysian library resources, libraries would subscribe to commercial local and foreign e-resources through consortia, and at the same time would develop local contents through centers of excellence in various specialized subject areas. The private domain would be accessible only to subscribing institutional partners. The public domain consisted of e-books, e-newspaper, e-maps, e-magazines, e-reports, e-catalogs, multimedia, theses and dissertations, conference papers and proceedings.

The National Library of Malaysia's website itself was reflective of their efforts with several born digital materials and numerous hyper text linkages to related websites.

Portal Yang di Pertuan Agong was developed in 2003, providing information on the Malaysian monarchy system (http://www.malaysianmonarchy.org.my/portal). *Digital Resources System* provided 6 selected categories (articles, books, conference/seminar, manuscripts, statistics and serials) of digitized information from the National Library of Malaysia's own rare collections, articles on and about Malaysia and local newspapers (http://digiserver.pnm.my). Online Bibliography / Directory listed subject bibliographies on independence, tsunami, the prime ministers and Harvard collections. It too has a complete directory of Malaysian libraries (http://www.pnm.my/direktori). *Virtual exhibition* displayed digitized items on local stamps, 1st day envelopes, Malaysian history, dengue, *I-baca, Citra Wanita,* Malay manuscripts and family library.

The Center for Malay Manuscripts (http://www.pnm.my/manuskrip) had started digitization project in 1990. They first started by producing in CD format *Manuskrip Melayu Pusaka Gemilang* and its equivalent *The Glorious Legacy of Malay Manuscripts,* followed by Malay Manuscript Online produced in 2002. Up to 2004, it consisted of full text manuscripts – 500 titles covering 1000 pages. According to Siti Mariani (2004), they faced two major problems in the digitization process. The first was indexing the Malays manuscript as subject knowledge and the ability to read the *Jawi* scripts were of important pre-requisite. Secondly manuscripts involved too much image that retrieval and accessing had been affected.

The launching of the International Islamic Digital Library (IIDL) in 2003 (http://www.iidl.net/) was another phase of the national digital library system. The National Library of Malaysia had been entrusted to take up the lead, in collaboration with 6 other local organizations. IIDL provided online information on Islamic scholars, links

to other Islamic websites, quotes, verses and hadiths, artifacts, articles, books, conference papers and journals, including a virtual tour to Putra Mosque in Putrajaya and a 3D presentation of Al-Quran manuscript (Siti Mariani, 2004). IIDL had been showcased at 10th OIC Summit in October 2003, MATRADE Caravan Show under ICT Initiatives@Jeddah and Sharjah UAE in December 2003 and lastly showcased at the World Summit on Information Society in Geneva in December 2003.

Internationally, the National Library of Malaysia had collaborated with UNESCO in creating e-Library User Education Module, an interactive online user education program, launched in April 2003. However not much information on it could be found. At regional level, the National Library of Malaysia participated as a member of Asia Pacific InterCity Digital Library project (Tedd and Large, 2005), but again not much documentation had been found about this except a web site developed by Aardvark – Asian Resources for Librarians (http://www.aardvark.info/user/subject7/index)/ and two articles on it written by Miao Qihao (2002) and Yang Xiong (http://unpan1.un.org/intradoc/groups/public).

2.2.2.3.2 Other selected local Digital Library Initiatives

Malaysian Digital Library Initiatives had not been much documented but a cursory search on some of the libraries' websites would enable us to see some of their efforts, as exemplified by some of the following. HIDS *(Hari Ini Dalam Sejarah)* Online http://hids.arkib.gov.my/scripts/samples/search was one of the contents of the Malaysian National Archive digital library initiatives. What they put online were the scripts of the once radio and TV programs that began in 1980. Photographs of memorials such as

Memorial P.Ramlee, Rumah Merdeka and past Prime Ministers too had been digitized. *Portal Ilmu* (http://ilmu.moi.gov.my/equip/custom/home.jsp), a digital library of the Ministry of Information had started the service of virtual reference desk, with special digital collections on Independence Day, *Memori Malaysia* and *Tun Mahathir's Collection*. *Filem Negara Malaysia* Library, a department under the same ministry was doing digitization programs, focusing on feature and documentary films that it produced as early as in the 1950's. Its Archimedia Video Clip contains many corporate videos and video clips of selected national events.

   Malay Civilization, officially launched on 31 January 2005, created by the Institute of Malay World and Civilization, Universiti Kebangsaan Malaysia (www.malaycivilization.com) could be considered as the global digital window for the Malay world, having digitized 1 million Malay *pantun*, Malay dictionaries, Jawi works, *Adat Perpatih*, Za'ba Collection , Malay World database called PADAT, and Malay proverbs. This Malay World Homepage was a very commendable effort (Ding, 2000). *Siti Hasmah Digital Library* of the Multimedia University (http://vlib.mmu.edu.my/2005/) was launched on 24 July 2000 to become the 1st digital academic university library for the nation. They had MMU theses online, MBA theses online, online exam papers, online photo library and MMU Repository Collection. Online renewal was also available together with E-Reference Desk. As at 30 October 2007, they were subscribing to about 200 online journal titles. *UNITAR e-Library* (http://vlib.unitarklj1.edu.my/) on the other hand claimed to be probably one of its kinds in the world for a university library to be in the electronic mode, operates on the same platform and delivered most of the services through the web and Internet thus reducing

the need to make physical visits to the information resource center. It provided linkages to postgraduate resources and library e-photo album, online reference and educational resources, online local and foreign newspapers and online newsletters.

Hospital Universiti Kebangsaan Malaysia Medical Virtual Library, also known as Tan Sri Lim Goh Tong Medical Virtual Library (http://lib.hukm.ukm.my/ukm2) launched in February 2000 (renamed UKM Medical Centre Virtual Library- UKMMCVL) had developed library portal, offering online full text databases, e-books, online services and medical images, and subscribing to more than 1000 electronic medical journals and databases. As for Universiti Kebangsaan Malaysia digital library initiatives, they chose to develop the university's knowledge content such as university publications, theses, research reports and seminar papers when they first started in 2002. In the second phase, it involved the digitization of a collection of speeches of previous vice chancellors and important senate minutes of meetings. The digitization of university lectures and the implementation of electronic/interactive learning were the 3rd and 4th phases respectively (New Straits Times, 14 July 2003).

Tan Sri Abdullah Sanusi Digital Library, Open University Malaysia launched on 24 February 2004 functions well with the concept of distance learning of the university (http://iportal.oum.edu.my/cgi-bin/gw_45_0/chameleon?skin=iportal_public).

Perpustakaan Tun Abdul Razak, University Technology MARA (http://digital.ptar.uitm.edu.my) digital collections had various topics such as online journals, seminar papers, journal contents pages, exam papers, news clippings, research reports, Tun Mahathir Collections, dissertation abstracts, Ibrahim Abu Shah articles and UiTM publications. Online research support for academic staff called Virtual Research

Facilitator (VRF) was launched on 3ʳᵈ May 2005 to enhance its digital reference service. *Perpustakaan Sultanah Bahiyah,* Universiti Utara Malaysia had similar digital collections with most of the other university libraries but had developed a repository called *iRepository,* whereby selected research and scholarly materials had been deposited by the librarians and academic staff http://cmslib.uum.edu.my/psb/index.php?)

Hamzah Sendut Library, University of Science Malaysia has had digitized MIDAS Bulletin for a very long time, besides their online collections on the exam of *Peperiksaan Tahap Kemahiran* (PTK), articles on USM Vice Chancellors, National Poison Center and National Laureate Collection (www.lib.usm.my). Even though a new university library, *Universiti Tun Hussein Onn Malaysia* (http://www.etawau.com/edu/UniversitiesPublic/UTHM.htm) had managed to provide digital library service mainly through subscriptions of 36,000 titles of e-books and 13,000 titles of e-journals and over 1000 scanned documents of exam papers and project paper abstracts. *Universiti Malaysia Perlis* established in 2002 was providing full text conference proceedings and full text theses and dissertations, besides *iRepository* at UniMAP Library Digital Repository (http://dspace.unimap.edu.my/handle/123456789/2424). *University of Malaya library* (http://www.umlib.um.edu.my/) had a unique OPAC called Pendeta Webpac that provided access to digital information via the online catalog. *Perpustakaan Sultanah Zanariah* (http://web.utm.my/psz/), University of Technology Malaysia had most of its operations and services computerized, including acquisition and indexing through its INFOLAN2, and had created repository for Digital Research Report.

PERPUN (Conferences of University Libraries and National Library of Malaysia)

too contributed in the creation of Malaysian digital library. Through *MyUniNet* Portal, it had developed MyTO – Malaysian Theses Online, Malaysian Gateway to Internet Resources, MyULIS and Malaysian Universities Repository Collection (http://portal.perpun.net.my/portal/services1.php). *PERDANA* Leadership Foundation Library, (http://www.perdana.org.my/portal/content/view/) launched on 29 April 2004 had digitized almost 1 million pages of its collection (as of April 2006) serving as a repository of works related to the policies, strategies and initiatives adopted by Malaysia's past Prime Ministers. Meanwhile the Department of Survey and Mapping Malaysia's library had created a Digital Cadastral Data Base, consisting of digital cadastral base-maps and an image library of certified plans, including restricted and unrestricted topographic maps, thematic maps, digital terrain model, miscellaneous map and aerial photograph (http://www.jupem.gov.my/Main.aspx?page=SPDK).

Digital content developments by state public libraries were also commendable. Selangor Public Library (http://www.ppas.org/my/) launched its e-library in line with the August Reading Month 2000 (New Straits Times, 17 August 2000), developing community portal through *e-Belia* and *e-Remaja* websites and created virtual exhibition on traditional Malay kites, dance and dresses, national flower, Selangor's flag, traditional musical instruments and selected Selangor collections. Perak State Library had digitized *Menara Jam Chondong Teluk Intan*; Penang State Library had digitized selected books from the Penang collection and Portal of the Chief Administrator of Penang 1786-; Sabah State Library had digitized selected antiquarian and historical collection and newspaper articles on Sabah; Sarawak State Library had digitized selected Sarawakania collection and Portal of the Governor of Sarawak; Kuala Lumpur Library had digitized annual

reports of the Kuala Lumpur City Hall, historical photographs and the architecture of Malay homes in *Kampong Baru* and also theses of staff members.

A local newspaper search revealed that many of the earlier reports were on the initial development of electronic libraries and there had also been few reports on digital library developments in the later years. From these reports, it seemed that Malaysian libraries were planning something and taking the necessary initial steps and ready to transform from print based, to electronic and then to digital library, with some minimal help from the government and private sectors.

Esso Malaysia was reported would assist in the development of Electronic Library in Kuala Lumpur by 2005 (The STAR, 10 June 1998, p. 3). *Connected Learning House* would goes online (The SUN, 28 May 1999, p. 8) and there would be multimedia digital libraries by 2005 (Business Times, 17 August 1999, p. 2). *MyLib,* the national digital library project was reported to help service the absence of libraries in Malaysian polytechnics (Utusan Malaysia, 6 July 2000, p. 19) and that the International Islamic Digital Library would be operational in May (Utusan Malaysia, 10 April, 2001, p. 13). The obstacles towards the development of electronic books were also mentioned (Utusan Malaysia, 29 May 2001, p. 7).

The Kuala Lumpur City Hall would spend RM36 million for the development of its digital library (Berita Harian, 1 August 2001, p.15). The news earlier as reported above in 1998 mentioned that Esso would help in the development of electronic library but when it was reported again in 2001, the term digital library was used. Thus the term had been interchangeably used as shown below and the progress of Malaysian digital libraries had always seemed to be originated from library automation and electronic

library. The International Medical University was reported to have embarked on a Virtual Medical University as part of its e-strategic initiative for the period 2002-2011 (New Straits Times, 28 October 2002, p.4). It was also reported that Malaysia would lead the International Islamic Digital Library Project (Utusan Malaysia, 23 November 2003, p.2). The British Council Library Kuala Lumpur was offering 20 global databases via e-library (The Sun, 21 April 2005, p.15) and MIMOS had started a pilot project *Malaysian Grid for Learning (MyGfL)* where one of the objectives was to teach the rural people sewing online (Utusan Malaysia, 5 October 2005, p.22). *Universiti Utara Malaysia* Library had intensified the use of e-books for its students in an attempt to become hybrid and was subscribing to 33,000 e-book and 28,785 e-journals from all over the world (Utusan Malaysia, 4th June 2007, p. 27).

There had also been some news reported in the newspapers concerning digital infrastructure such as the effort of the Ministry of Energy, Communications and Multimedia in allocating RM158 million under its Universal Service Program for 2003 was indeed commendable, as it intended to provide Internet access for the rural folk (Computimes, 19 September 2002, p.1). The Ministry anticipated a total of 2.8 million of the rural people would enable to access the Internet through their Rural Internet Program in 2006 (Utusan Malaysia, 24 June 2003, p. 15). Under the initiative, some 1000 schools, 300 clinics and 300 libraries in the rural areas would be provided with Internet access. These would slightly improve the Internet subscribers as at July 2002 that stood only at 2.4 million as compared to 4.69 million fixed line telephone subscribers. Meanwhile the Malaysia Communications and Multimedia Commission (MCMC) had set a target of

broadband access for 2 million households in the country by 2010 (New Straits Times, 24 January 2008, p. 23).

There had also been concerns about digital divide as reported that RM1 billion would be spent to reduce digital divide (Utusan Malaysia, 24 April, 2001, p. 12). There had been attempts to bridge digital divide via cyber camp (Computimes, 25 November 2002, p.33). The government had allocated RM 500 millions to reduce the country's digital gap under the 9th Malaysia Plan (Utusan Malaysia, 3 June 2006, p.16), focusing on reducing the gap between the urban and rural people. The urban and rural digital divide in Sarawak would be narrowed when another 92 village libraries were hooked up to the Internet by September 2007, at a cost RM 36.7 million (The Star, 4 June 2007, p.29). This was not an easy task, as reported in the newspaper, looking at the statistics whereby only 11% of the rural people owned a computer as compared to 89% of their urban counterparts. Internet usage was even worse. 93% of the urbanites did have access to the Internet as compared to only 6.7% among the rural people. The above scenario was not conducive for a national digital library development.

As could be seen from the above discussions and scenarios, what was really lacking in Malaysian digital library initiatives was the absence of a strong and central coordinating body that collaborative efforts for digital library initiatives had been minimal. Each library was planning, digitizing and developing digital library initiatives independently and only the National Library of Malaysia and *PERPUN* had initiated collaboratively national digital library programs. Many of the digital library efforts had been localized, focusing on e-subscriptions of e-journals, information surrogates i.e. digitization of organizational materials in order to provide online services and remote

access, besides preserving them as institutional memories and the development of organizational websites/homepages. According to Cleveland (1998), there were three methods of building digital collections: 1) digitization, 2) acquisition of original works and 3) access to external materials. And it seemed that Malaysian libraries had done a lot through the third method i.e. giving access to external materials through online subscriptions of e-books, e-journals and commercial databases and supported by Law (2004) that many libraries were going digital by subscribing to online databases. Digital reference works had also been done but in a smaller scale and it was found that they were becoming more available in Malaysian academic libraries and primarily provided assistance to remote users mainly through e-mail format (Wan Abdul Kadir, 2008).

With limited budget and basic telecommunication infrastructure and digital policy, and the presence of digital divide, digital development would be rather slow. As a result the concepts of resource sharing and virtual re-unification of digital resources had not been truly observed. The findings from both the survey and interview sessions later in the research would consolidate these early observations.

2.2.3   Research on Digital Library

The earlier literature review on western digital library initiatives showed that digital library research was fundamental in taking it to a greater height. Griffin (1998) was also of the opinion that digital library research was essential to enabling more people to better create and use vast amounts of distributed information and to contribute to the quality and quantity available via the web and future access frameworks. Much of the research during the initial stages was on digitizing existing sources (Patra, 2006), but

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later digital library projects were more concerned with issues such as sustainability and interoperability (Secker, 2004). This was supported by Ali (2003) when he said that while structural and semantic interoperability had been the focus of digital library in the early 1990's, interoperability too was one of the most heavily discussed issues as also the challenge of developing and implementing digital library systems in multilingual and multi-cultural environments (Tedd and Large, 2005). As such cross-lingual semantic interoperability had become one of the focuses in digital library research in the late 1990's (Yang and Kar, 2005).

However in an attempt to retrieve the relevant digital library research, particularly on the extent of digital library initiatives and perceived conditions for future growth, it was found that there had not been many that were really relevant to the topic at hand. Rusbridge (1998) had identified that digital library initiative was more of a computer science research program. Supported by Borgman (2000) that digital library research, particularly conducted in the department of computer science, had been focusing on enabling technologies such as database structure, retrieval algorithms, filtering, intelligent agents and network architecture. Many researchers felt that such advances would be enhanced by technology insertion from the fields of information visualization, human-computer interaction, and cognitive psychology (Boyack, Wylie and Davidson, 2001).

Soergel (2002) had identified ten themes for digital library research and development and many research works had been done on searching and retrieving objects across variations in protocols, formats and disciplines. This was supported by Khoo, Buchanan and Cunningham (2009) when they said that the focus of research was often on technical issues such as information retrieval methods and software architecture, rather

than on user-centered issues. Fuhr (1999) studied information resource discovery in distributed digital libraries, a resultant of its new concept. Digital libraries were built around collections of digital objects that came in various different formats, representing huge collections that make search difficult. Karl, (2001) presents MARIAN – a digital library system designed and built to store, search over and retrieve large number of diverse objects in a network of relationships. Aalberg (2003) explored the Digital Library Link Service, used to create consistent information spaces on top of digital library repositories and enable associative organization and retrieval of information objects.

Local contents development and born digital materials were considered important besides information surrogating, as Lloyd (2000) emphasized on the importance of information content than the systems used for its storage and retrieval. The research described the motivation design and implementation of buckets at few experimental digital libraries and believed that digital information should have the same long-term survivability prospects as traditional hardcopy information. The extensive use of digital library depended on the ease of use and appeal of the user interface. Hence the design and development of a versatile and friendly user interface for digital library became indispensable (Kavitha, 2000).

Shi (2005) studied the challenges and issues faced in federating heterogeneous digital libraries. This research demonstrated the feasibility of interoperability among non-cooperating digital libraries by presenting a lightweight, data driven approach or Data Centered Interoperability (DCI). Gore-Chandorkar's (2005) research was on emerging issues in the use of libraries as public spaces and as information repositories in the digital age. Four libraries differing in the technology and quality of space provided had been

chosen as case studies. The shifting physical form and meaning of the library's architectural space and its implications for the design of future libraries were examined.

Jeng (2006) did a research with the main objective to develop a model and instruments to evaluate the usability of academic digital libraries, from the points of effectiveness, efficiency, satisfaction and learn ability. A two-layered digital library model was also presented to enhance current digital libraries to support different levels of human cognitive acts, enabling new kinds of knowledge exchange among library users (Feng, Jeusfeld and Hoppenbrouwers, 2005). Sapa (2005) found that American academic libraries tend to perform all their functions completely on the web and had move as many services and resources as they could to the new online and digital environment. Lorigo (2006) studied information networks that were prevalent in the cyber era and in understanding of such networks in creating and organizing knowledge. Related to Knowledge Management, the research laid the foundation for a prototype *Formal Digital Library*.

However there had been a few research that were user centered such as Goon's (2004) research on the factors influencing perceived usefulness and ease of use of digital library technology by post-graduate students in Malaysia. Elise (2001) investigated to determine if there was sufficient basis for the development and implementation of best practices model to help other libraries made their own transition. Respondents were also in agreement that e-journal spending would require more of their library budgets in the future and recognized the popularity of e-information and believed that their journal collections would shift from print to electronic. Digital library was favored with the understanding that it would helped save library space and research by Faridah (2001) on

digital library buildings concept found that it involved a lot about integrating spaces between the digital and print collections to ease information retrieval. Lardy's (2006) research was also in digital libraries design but on the computational combinational methods. The proliferation of e-resources and digital libraries had a significant impact on the use of print resources and traditional libraries whereby graduate students seemed to expect a hybrid of print and e-resources (Liu, 2006).

Wan Abdul Kadir (2008) did a study on the digital reference services in selected Malaysian academic libraries, whereby it was found that they were becoming more available in Malaysian academic libraries and primarily provided assistance to remote users mainly through e-mail format. Mahesh and Rekha (2008) looked at a bigger scope researching on digital library in India and suggested that it should focus more on education, training, copyright management and amending copyright legislation.

After a decade of digital library research and development, digital libraries were moving from research to practice, from prototypes to operational systems (Borgman, 2002). Digital library research which initially focused on issues related to technology, architecture and standards had matured to encompass a holistic approach to digital libraries and their users (Borgman and Rasmussen, 2005). To accelerate digital library progress, research at all levels must be emphasized. Digital library research as could be seen from the discussions above, were more geared towards improving storage, retrieval systems and access, user interface, best practices model for digital libraries, online instructional resources and digital library in school, metadata, interoperability, developing functional open sources repositories, digital library design and digital reference service, thus setting the trend for future digital libraries.

2.2.4   Digital Library Related Problems

The development of digital libraries had been technology dependent that it saw the real need for collaboration between the information professionals and the computer scientists. As manifested by the Ibero-American Science & Technology Education Consortium (ISTEC), the model of creating synergism and connections between librarians and computer scientists on basic digital library projects would continue to be replicated in other parts of Latin America (http://curric.dlib.vt.edu/wiki/index.php/ETD_Guide:Training_the_Trainers-Initiatives_to_support_ETD_projects_in_Latin-America).

Perhaps one of the greatest challenges of purchasing electronic resources for the digital library was negotiating a satisfactory license agreement (Ochs and Saylor, 2004) because the procedures and workflow for print materials did not always work for electronic resources. The academic libraries in Taiwan were experiencing the same problems of expensive subscription fees, complicated licensing agreements and scarce technical staff for solving network and computer related programs. To tackle this problem, a library consortium was set up in September 1998 with a goal to bring in foreign electronic resources cost-effectively.

There were also the lack of standards and consistency especially in Electronic Thesis and Dissertation initiatives and there had been little coordination because of lack of implementation mechanism (Griffin, 1998). He further reiterated that the large scale digital library projects required several years to complete and required a stable and predictable funding stream to retain essential staff. There was also a great deal of new technical infrastructure that would be required for institutions to support large scale

digital collections. The task of building an institution's digital library infrastructure would be more of systems integration than of system building (Flecker, 2000).

On top of this, the digital library required us to engage in thoughtful consideration of the preservation of the information it contained. As an example, the Library of Congress, as recipient of mandatory deposit copies in the United States, lags significantly in receiving and archiving the born digital products of the nation. In another perspective, as the Library of Congress expanded its digital initiatives, one of the pressing challenges was scaling digital contents transfer processes that were linked with digital preservation. Transfer processes must be performed properly to mitigate preservation risks (Littman, 2009).

Traditionally, libraries owned the acquired materials but many digital resources were maintained by vendors or publishers. Some of the toughest questions for all libraries were related to ownership of digital information and the highest cost of acquiring, accessing, maintaining and preserving it (Fineberg, 2000). He further added that one enduring role of libraries during the transition from physical to digital information would be the intellectual task of cataloging, since the metadata environment was evolving rapidly. Other problems mentioned in the *LC21: A Digital Strategy for the Library of Congress* were related to infrastructure i.e. the lack of information technology security and underpowered networks. The collection centered concepts of digital library typically touched on just one aspect of technology (that of storage) and neglected organizational issues (Travica, 1997).

Ying (2003) reported several problems encountered for the collaborative Aberdeen Geo-referenced Digital Library Project with Alexandria Digital Library. Some

of these were the establishment of unified framework, problem of purpose, infrastructural problems, classification of digital items to be collected, compatibility of partners resources, networking strategies and that a strategic need alone was insufficient justification to launch any project. Center for Digital Library Research at Strathclyde University in Glasgow aimed to work on major elements of the problems such as user needs and user interfaces, collaboration collection development, content creation and maintenance, interoperability problems, navigation and integration issues, access control, metadata and standards and policy framework (Chowdhury and Chowdhury, 2003). Other problems were related to integration of information technologies, digital library tools and software, models for resource development, IT training needs, content development and copyright management (Jeevan and Dhawan, 2002). Where as in the early years of digital library development in India, some of the problems faced were high infrastructural costs, lack of experience and also lack of expertise (Mahesh and Rekha, 2008).

The practice of outsourcing of some of the digital library projects however, might result in a loss of control and oversight. An organization that outsourced its digital collection building would want to have clear, comprehensive instructions, an evaluation plan for quality assurance and a clear understanding with the vendor about remedies should the vendor work failed to meet specifications (McGuire, 2007). The Massachusetts Institute of Technology libraries were working with *DSpace* to explore the problems of capturing research and teaching materials in any digital format and preserving it over time. They were beginning to see ways of managing arbitrary digital content that might make digital preservation an achievable goal, since *DSpace* was more concerned with communities and preservation (Fox, et al. 2005).

Copyright law was complex and ambiguous. While copyright issues had been debated and settled to some extent in the print environment, copyright in the digital era was far from settled (Ochs and Saylor, 2004). It posed many challenges for librarians, but it was crucial that librarians had a basic understanding of the various provisions of the law in order to make informed decisions (Ferullo, 2004). The copyright law in the United States was the amended Digital Millennium Copyright Act (Lopatin, 2006) passed in 1998, to address the use of copyright in a digital world (Ferullo, 2004) and according to Lesk (2005) the DMCA gave a special protection to Internet Service Providers. American librarians continued their efforts to oppose censorship challenges that would restrict the free flow of information (ALA, 2007). The New Zealand National Library Act 2003 had the capability to collect, preserve and make accessible digital objects in online and offline formats. The intention was for the New Zealand National Digital Heritage Archive to include websites, published works, images and materials contained in CDs and floppy disks (Reid, 2006). In the United Kingdom, with a significant growth in institutional repositories, there had been gradual moves towards mandating the deposit of electronic versions of theses (Russell, 2007).

The i2010 vision of the European Digital Library too was facing problems such as the digitized materials were becoming available too slow, in too small quantities and from too few resources. This problem was due to high cost of digitization, the unsatisfactory of Optical Character Recognition software for historical documents and the lack of institutional knowledge and expertise which causes inefficiency and re-inventing the wheel (Ploeger, 2009).

2.2.5 Library Collections, Operations and Services

Digital resources had revolutionized traditional library operations and services. Librarians in the 21st century would have to change their thinking about collections (Fineberg, 2000). The recent literature on digital library policy talked about digital collection development policy, copyright policy, privacy policy, links policy, selection criteria, retention and renewal policy, and purchased and licensing agreement. As noted by Ochs and Saylor (2004), the mid-to late 1990's found many libraries developing collection development policies for electronic resources. An Association of College and Research Libraries, United States membership survey released in May 2006 (ALA, 2007) highlighted top concerns, including an increased emphasis in digitizing collections, preserving digital archives and improving methods of data storage and retrieval.

In a digital environment, there was a general tendency to offer more online information and services. Libraries worldwide were now doing digitization works, transforming the analog collections into digitized format, either through surrogates or born digital materials. Succinctly, in the 1990's there was a great drive towards digitization activities and making available electronically as much heritage and information as possible (McKinney, 2006). As the library offers more online services, use of some traditional services had declined, particularly circulation and the use of CD-ROM resources (Pack and Pemberton, 1999). Libraries were integrating electronic resources and services with the collections and developing new selection and management models to accommodate them (Cuesta, 2005).

Operations and services had to be changed in tandem with the features of digital libraries of the 21st century where information could be searched and their contents

transmitted around the world (Crane, 2006). In a time of rapid technological development, the spread of digital information and the wide diversity of staff skills now incorporated within information services, an information service needs to be readily adaptable, flexible and prepared to be in constant change (Lovecy, 2007). The number of people accessing digital collections showed explosive rates of growth, emerging as crucial component of global information infrastructure and more than 70% of world's scholarly literature were born digital (Sreekumar and Sreejaya, 2005) and over 93% of new information produced was also born digital (Wiggins, 2001) to the extent that libraries began to view their services and products in the context of a global information society (Lunau, 2006).

Over the past decade there had been substantial progress in the use and delivery of digital resources. Patrons' expectations for distance service delivery across library services would increase (Koehler, 2004). This evolving area had now reached a point of maturity where digital library providers, had begun to identify common service requirements and service frameworks. These emerging digital library services might be delivered in a distributed manner or shared centrally. The core aim of these approaches was to achieve interoperability, ease of access management and use, as well as ways in which to manage digital resources into the future (Beagrie and Bruce, 2006). As the establishment of repositories continued to grow and the potential for using repositories to store, manage, aggregate and provide access to a wide range of materials began to be realized (Allinson, 2007), this must be given a serious thought because repositories was one way towards achieving interoperability in an open world.

For libraries opting for information surrogates, selection of materials was of prime important. Depending on the objective of the effort and the availability of budget, normally they would prioritize the materials that commanded the highest usage. Selecting digital materials entails different factor than selecting print materials. Through digitization, the library was able to provide all sorts of materials – texts, photographs, audio, manuscripts, and moving image materials, some of which were rare, fragile and unique (Lopatin, 2006). In 2008, the Nevada State Library and Archives released the *Nevada Statewide Digital Planning Survey Summary Report* whereby it was found that the top materials digitized were flat works on paper/photographic prints, maps, architectural drawings, posters, and film materials. They were also acquiring born digital resources including still images, simple text encoded text (blogs, websites, PDF documents), digital audio and digital video (Starr, 2009).

As mentioned earlier, Cleveland (1998) said that there were three methods of building digital collections: digitization, acquisition of original works and access to external materials. Providing access to external materials through subscriptions to e-resources (e-books, e-journals) was the fastest way offering digital content where leased electronic resources were made available without being acquired (Fenner, 2004). Most importantly, it could be linked to a whole web of other content, locally and globally via the Internet (Hughes, 2004). Today many libraries were going digital by subscribing to online databases and through digitization program of the library's collection even though it was a common place that not all existing collections would be digitized (Law, 2004). Establishing hypertexts linkages to related websites/homepages was also another option of giving access to external materials.

Digital materials were never considered to comprise a separate collection. Instead they were treated as part of the whole. The successful building of digital library collections would necessarily be composed of collection development aspect, technical aspect, system aspect and access aspect (University of Oregon Library System, 1998). Electronic resources still needed to meet subject and quality criteria for selection just as publications in other formats did (Kara, 2004). Electronic resources were more prolific than ever. E-publishing started to rise after the invention of the e-book in the early 70's (Ardito, 2000) and publishers were moving information from print to electronic formats at an ever increasing rate, requiring libraries to adapt to these new formats (Carrico and Smalldon, 2004). E-books were expected to be the new medium of knowledge transfer due to their plenty advantages that were inherited from the computer and Internet technologies (Zahda, 2007).

Digital library would also result in a unified collection development pattern, especially when different organizations work together on a digitizing project. For example, in the Colorado Digitization Project, three different entities hold materials on the Japanese internment camp, and they were working together to build a unified digital collection (Allen, 2000). The Management Board of Library and Archive Canada (LAC) had approved *Digital Collection Development Policy* on 1st February 2006, indicating the directions LAC took to ensure the collection of digital documentary heritage materials of enduring interest to the history and culture of Canada (http://www.collectionscanada.gc.ca/collection/003-200-e.htm). Collection development had really been challenged by digital library development, impacting acquisition librarian and new concepts were now emerging.

Universal access must be the fundamental criterion in creating new digital library services. Centralization of library materials was no longer the rules as digital library concept operates from distributed locations but accessible as a single entity. A collection commonly extended beyond resources the library owns to include all the resources to which it could provide access (Fenner, 2004). Therefore libraries must stress on dynamic virtual reference service, online document delivery and practice e-payment. In an increasingly networked world, more and more libraries were providing virtual reference service as information resources became more web based and more actively used by patrons over the Internet (Jin, 2005). As it was becoming the standard service of digital library, collaboration among virtual reference service was also becoming more important for information provision and sharing (Jin, 2007).

From the literature review, it was observed that the extent of the digitization projects of some of the international organizations and countries covered were much advanced and their digital library initiatives were tremendous, having at hand many digital library projects at all levels and had digitized millions of items. The American Memory Project had digitized 9 million items as of June 2007. The *NBdigital* of Norway that started digitization of its first book in March 2006, but by Spring 2009, the digital collection was comprised of 90,000 books, 200,000 newspapers, 3100 hours of film, 250,000 hours of radio broadcast, 420,000 photographs and 23,000 manuscripts (Takle, 2009) as compared to only 600,000 pages of digital information done by the National Library of Malaysia as of September 2008.

Universal access was all that matters in a digital library environment. Gearing towards the concept of resource sharing to the fullest, the future of the library could be summarized as a move from content to service (Law, 2006).

2.2.6 Training

The transformation of libraries from print to digital based definitely required training from basic to the more advance stage that might include some elements of computer science knowledge. Expanding services might demand increased resources for staffing (Johnson, Reid and Newton, 2004). In the constantly changing digital environment, the hiring, training and mentoring of staff took on even greater importance (Turner and Raskin, 2004). The creators of digital libraries had to be knowledgeable about the all the encompassing aspects involved in digital library creation and management. Training programs were essentials to educate and impart skill sets to library and information professionals so that purposeful digital libraries were created in the right context, essence and manner (Mahesh and Rekha, 2008). In addition, the information professionals of today must discharge their duties in a hybrid environment, one that dealt with print documents but digital documents as well (Varalakshmi, 2009).

Many skills were needed to build digital library. All library staff must be willing to train themselves to understand information technology well enough to recognize its value and apply it in their daily work. Technical staff must work along with librarians to build the digital library (Ochs and Saylor, 2004). Specialists had and would continue to have important roles in libraries (Kara, 2004). A digitization project staff might include any combination of the following: advisory board, project manager, curatorial staff,

archive staff, library staff, volunteers, interns, catalogers, systems analyst, programmer, web designer and photographer. Plans to digitize must reflect the institution's ability to train individuals to the highest level of quality, constant re-training and re-positioning of staff (ECHO, 2007). A research by Jeevan (2007) found that the emergence and increasing availability of the Internet had led a lot of information outside the library tempting users to depend less on libraries and the plight of library professionals in India had resulted in low morale and under performance. Therefore the development of in-house expertise should be given a high priority (University of Oregon Library System, 1998).

Harvard's Digital Library recognized the need to build a team of expertise in various areas particularly metadata, digital formats, reformatting technology and workflows, licensing, Intellectual Property Rights, preservation of digital objects, interface and access issues (Flecker, 2000). Northern New York Library Network emphasized through various workshops on planning digitization projects, imaging (scanning, digital cameras image editing), digital copyright, FrontPage workshop, basic HTML and introduction to XML (http://www.nnyln.org/digsummary.html). In the New Jersey area, local library consortia offered inexpensive training opportunities with topics such as digital library project planning, grant writing and digitizing. The New Jersey State Library, PALINET, METRO (Metropolitan New York Library Council) and the New Jersey Digital Highway all offered periodic training opportunities (Beard, 2007).

Kaur and Singh, (2005) highlighted the need for a national information policy and for the training of information professionals to accelerate the transformation of traditional libraries to digital libraries in India. Quality digital librarians with well-rounded

characters were critical for the development of digital library and librarian would be a represent of superiority in this major revolution in human knowledge (Qian, 2005). In South Africa, the Department of Information Science, University of Pretoria had taken steps to train an efficient digital reference librarian in anticipation of the ever growing changing of the digital environment (Penzhorn, 2007). Columbia University's School of Continuing Education had launched a new part-time Master of Science in Information and Digital Resource Management, beginning September 2009 intake (http://www.cecolumbia.edu/InfoDigital). Training was so important that McDonald (2000) stressed the need for information professionals who had the skills and experience to turn our vision for a digital library into a reality. *DL.org* – a recently funded European Commission Project spearheading the importance of interoperability provided a forum for knowledge exchange supported by *eTraining* courses designed to enable the next generation of digital library professionals (Castelli and Parker, 2009).

In Malaysia, to support the Community Learning House (CLH) project, Microsoft (M) was training the national and state libraries' staff and providing consultancy services. Training on hyperlink, information packaging and user education program were provided by the National Library of Malaysia and Microsoft (M) also sponsored training of MS-Windows and N.T 4.0 and web page development. In addition, during an International Conference and Workshop on Multimedia Digital Library held in Kuala Lumpur in 1999, two fundamental issues on digital library training had been identified. These were to systematically plan a continuous training program for librarians and library users in the digital environment and to educate library staff and users in copyright.

2.2.7   Budget

In terms of resources, a robust digital library initiative would require a significant investment of money, time and effort (University of Oregon Library System, 1998). Digitization projects were complex and the cost was always more than you expected (Webb, 2000) and it required significant amount of investment (Chowdhury and Chowdhury, 2003). The early sense of digital libraries was heavily influenced by several funding programs and many libraries depended on grants to support their digitization projects (Chepesiuk, 2001). In the early and mid 90's, digital library potential received programmatic amplification through funded digital library initiatives within the European Union, the National Science Foundation, United States and through the Electronic Libraries programs in the United Kingdom (Dempsey, 2006).

The importance of budget and sponsorships from both the government and private sectors for the success of digital library development were tremendous and extremely important as illustrated by the discussions below:-

In the United States, Digital Library Initiative 1 and 2 had a combined cost of US$68 million in terms of federal research grants (Fox, 1999) for the year 1994-1999, that included 12 international digital library projects involving partners from the United Kingdom, Germany, China, Japan and Africa. Defense Advanced Research Projects Agency, National Aeronautics Space Administration, National Library of Medicine, National Science Foundation, and The Institute of Museum and Library Services, were some of the generous federal grant awarding agencies that promoted leadership, innovation and lifetime learning by supporting the nation's museums and libraries. (Lopatin, 2006).

Other co-sponsors were Library of Congress, National Endowment for the Humanities, Federal Bureau of Investigation and the National Leadership Grants for Libraries Program (http://www.dlib.org/projects.html). ITR (Information Technology Research) as part of DLI-2 funded another 15 digital library projects (Chen, 2005). The significant contributions made by National Science Foundation, where its digital library initiative had a research focus (Dempsey, 2006), Defense Advanced Research Projects Agency and National Aeronautics Space Administration in sponsoring early research programs had actually helped built an international digital library community.

As reported in the *LC Information Bulletin*, February 2000, a budget of US$21.3 million was tabled to the House Sub Committee on Legislative Appropriations to continue the pioneering work of the National Digital Library Program. For Fiscal Year 2001, a request of US$428 million was made (Fineberg, 2000). In fact, Library of Congress's first international digital library project with the Russian National Library was funded by a special US$2 million in the Library's FY 1999 budget (Campbell, 2006). The National Science, Technology, Engineering and Mathematics Digital Library as part of the DLI-2 project had funded three rounds of grants during FY 2002 for 119 grants at approximately US$64 million (Mischo, 2004). In December 2000, the United States Congress passed a legislation establishing the National Digital Information Infrastructure and Preservation Program (NDI-IPP) in the Library of Congress and with it was a state funding amounting to US$100 million (Friedlander, 2002).

When California Digital Library first started, the President allocated new funds from discretionary sources. The initial investment of $US1 million was supplemented in 1998-1999 and 1999-2000 budgets by new permanent state funds totaling $US 5.5

million. The 2000 –2001 budget concluded $US 2.5 million to expand the California Digital Library collections and services. The Alabama Virtual Library was a US$3 million cooperative effort that brought an extensive collection of online resources to Alabama's schools, colleges, universities and public libraries. Funding for both Kentucky Virtual Library and Kentucky Virtual University was made available through the Kentucky Postsecondary Education Improvement Act in May 1997.

The Mann Library of the Cornell University had been awarded an average of 8 grants, totaling approximately US$790,000 / year over the past five years (Faiks and McCue, 2004). Harvard University had granted US$12 million to the university library to fund a 5 year project *Library Digital Initiative* to build its first generation digital library infrastructure (Flecker, 2000) and their 5 year digital initiative program had cost some Pound Sterling $12 million (Lesk, 2004). The Colorado Digitization Project provided US$10,000 to cultural heritage organizations already knowledgeable about digitization, and producing at least 3000 additional digital objects (Allen, 2000). US National Archive and Records Management had built Electronic Records Archives in 2005, costing US$308 million. When completed in 2011, the system would accept, preserve and makes accessible far into the future any type of electronic document (Wilson, 2005).

Private donors too supported digital library development. AT&T funded the Alexander Graham Bell collection. Reuters contributed $US1 million to put the Washington and Jefferson presidential papers online. South Carolina public libraries received $US 4.3 million from Gates Learning Foundation to help developed DISCUS – South Carolina's virtual library (Public libraries.., 1999). The grants provided software, hardware, technical support and training (http://www.scdiscus.org/). In March 2000,

Massachusetts Institute of Technology Library received US$1.8 million grant from Hewlett Packard to build *DSpace* system, a dynamic open source institutional repository (Smith, 2003). The Ford Foundation contributed Rs75 lakhs in the development of *Vidyanidhi* Digital Library, a national digital repository for Indian ETD (Shalini, 2003).

When Library of Congress announced in 2005 to create *World Digital Library*, Google was the first private sector partner with a funding of US$3 million (LC News Release, 2005). San Francisco based *Internet Archive* (www.archive.org/) was building a digital library of Internet sites and other cultural artifacts in digital form and received funding from Alexa Internet, the Kahle/Austin Foundation, the Alfred P. Sloan Foundation, the William and Flora Hewlett Foundation and the public (Kelly and Mason, 2006). In 2008, the Cornell University Library, New York University Libraries and the Florida Center for Library Automation announced the receipt of an Institute of Museum and Library Services National Leadership Grant for TIPR (Towards Interoperable Preservation Repositories) (Caplan, 2008).

In the United Kingdom, the Elib Program, started in 1994, though had ceased operations, had cost the Joint Information Systems Committee, British Pound 20 million for a period of 7 years and 70 projects (Pinfield, 2004). Phase 3 of Elib involving 21 organizations had been granted a budget of 4.12 million Pound Sterling (Secker, 2004). The government granted 240 million Euro to the People's Network project (http://www.peoplesnetwork.gov.uk) that by 2003, all 4000 British public libraries had the necessary equipment (including some 30,000 PCs) to enable free access via the web (Tedd and Large, 2005). The Wolfson Foundation and the Department for Culture Media

and Sport had made 3 million Pound Sterling available to United Kingdom public libraries.

University of Central England Electronic Library, which began operations in 2000, was the outcome of a Library Development Plan with a budget of over 1 million Pound Sterling, derived from the United Kingdom's Higher Education Funding Council for England capital funding (Dodd and Andrews, 2004). The Joint Information System Committee was investing some 13.8 million Pound Sterling to allow digital objects to be managed locally and accessed globally. Undertaken by United Kingdom Office for Library and Information Networking, this had resulted in a national architecture that included digital repositories, digital preservation, discovery to delivery, tools and innovation and shared infrastructure (Jacobs, 2006). United Kingdom's first electronic library project ELINOR was funded by De Mont Fort University, the British Library and IBM, UK (Ramsden, 1998).

The *24hr Museum* (http://www.24hourmuseum.org.uk) that costs Pound Sterling $70,000 was made possible by the funding from Department of Culture, Media and Sport, Museums, Libraries and Archives Council (MLA), the Department for Education and Science and the Arts Council (Pratty, 2007). Funding for the Center for Digital Library Research projects at Strathclyde University in Glasgow, came from the university itself and its partners - Research Support Libraries Program, *Elib* (the Electronic Library Program), Scottish Higher Education Funding Council, and Joint information Systems Committee (http://cdlr.strath.ac.uk/). In 2001, Scottish Higher Education Funding Council awarded British Pound $688,000 to Aberdeen Geo-referenced Digital Library project in Scotland to collaborate with Alexandria Digital Library in the United States.

SUN Microsystems too contributed to this project through British Pound sterling 1 million worth of hardware (Ying, 2003).

The National Science Foundation, US was promoting international joint research on digital libraries (Sugimoto, 2001). The United Kingdom Joint Information Systems Committee joined this endeavor and committed British Pound $500,000 for a three year period (August 1999 – July 2003) to fund new development work (Secker, 2004) and funded six research projects under the auspices of the International Digital Library Initiative (Hughes, 2004). CASPAR (Cultural, Artistic, and Scientific knowledge for Preservation, Access and Retrieval) began in April 2006, was the European Union integrated digital library project with a budget of 16 million Euros (8.8 million Euros from the European Union) (Giaretta, 2006). They also co-funded PLANETS (Preservation and Long-term Access through NETworked Services) and DPE (Digital Preservation Europe), all coordinated by British organizations (Hockx-Yu, 2007). For the past four years, the European Commission had invested more than 100 million Euros in funding for digital library research. The National Digital Library of Norway *NBdigital* that planned to digitize its entire collections, spent GBP 2.1 million in 2006, GBP 1.8 million in 2007 and for 2009, its budget amounted to GBP 2.8 million (Takle, 2009).

The first funding of RMB40 million Yuan (US$4.84 million) for the China - US Million Book Digital Library Project came from the Ministry of Education, China, channeled to Zhejiang University in September 2003, supported by the National Science Foundation, US and the governments of India and China (Zhao, 2004). The National Science Foundation awarded Carnegie Mellon $3.63 million over four years for equipment and administrative travel. India provided $25 million annually to support

language translation research projects. The Internet Archive provided equipment, staff and money. The University of California Libraries at Merced funded the work to acquire copyright permission from American publishers (Wikipedia, 2007).

In 1995, the then Prime Minister of Australia announced a budget of AU$10 million for digitizing projects at the National Gallery and the National Library of Australia. The Australian Cooperative Digitization Project involved preservation, microfilming and digital scanning of Australian serials and fiction, in the period of 1840-1845. Funded by the Australian Research Council for $AU345, 000 and was done by the National Library of Australia with the State Library of New South Wales, the University of Sydney and Monash University libraries. Total funding was $AU461, 000. Monash University also received in 1995 a research grant from the VC's Committee and its 1996 Quality Funds to conduct a pilot project in transferring the Australasian Journal of Engineering Education to electronic media. (http://elecpress.lib.monash.edu.au/ajee).

The Australian Research Repositories Online to the World (ARROW) Project in 2003 was funded by DEST (Australian Commonwealth Department of Education, Science and Training), a consortium consisting of Monarch University, University of New South Wales and Swinburne University. The National Library of Australia was granted $AU3.7 million for 3 years (2004-2006) and another $AU4.5 million for ARROW 2 in 2007. ARROW would go live in April 2008 (Groenewegen and Treloar, 2007). The Australian government attempted to develop a more structured approach to the funding of digital library activities through the Systematic Infrastructure Initiative (SII) and the Australian Research Information Infrastructure Committee (ARIIC). In 2003, ARIIC funded four FRODO projects (Federated Repositories of Online Digital

Objects) to the tune of $AU22 million. In 2005, ARIIC provided funding to nine MERRI (Managed Environment for Research Repository Infrastructure) projects (Hunter, 2006).

The New Zealand National Library received a $3 million boost in the government's new budget for the year 2000. New Zealand National Library's National Digital Heritage Archive program received NZ$24 million from the government to fund the establishment of this trusted digital repository (Reid, 2006). In Japan, the Council on Industrial Structure, Information Industry Committee recommended to MITI Japan to actively promote information technology to the public sector. As a result in the 2nd and 3rd supplementary budgets for fiscal 1993, MITI appropriated a total of Yen $7.45 billion to the IPA (Information Processing Technology Promotion Agency) to carry out projects in four areas, one of which was on pilot electronic library.

Canada's Digital Library Task Force received funding of $2.5 million/year for the period 2000-2001 under a program managed by the Department of Heritage. The Danish Ministry of Culture granted DKr 2 million for a digitization project of the Danish cultural heritage. The National Library of Denmark received the funding for the year 2003-2005 (Liu, 2005). A new digitization initiative was established in 2006 by the National Library of Norway with an allocation of 1.25 million Euros, focusing on the digitization of books and journals (Brygfjeld, 2002).

The budget of Taiwan's National Digital Archives Program for the first 5 years were NT $339, $368, $530, $638 and $645 million. The second phase in 2007 covered the period until 2011 (Chiu, 2002). The Singapore government was fully behind the Singapore ONE digital library initiative and invested S$300 million in infrastructure. The National Library Board Singapore spent about S$2.5 million on Electronic-Library

Management System (EliMS). In February 1998, *Legal Workbench* an electronic law library was launched at a cost of S$4 million and it was a collaborative effort between National Computer Board, Kent Ridge Digital Labs, Singapore Parliament, Attorney General's Chambers, Butterworth's Asia, the Law Society of Singapore, the Singapore Network Services and Academy of Law (Lim, 1998) (http://www.lawnet.com.sg).

Locally, the International Islamic Digital Library under the National Library of Malaysia received an initial grant of RM20 million from the Organization of Islamic Countries (OIC) (Siti Mariani, 2004). As reported, the National Library of Malaysia was expected to allocate about 50% of its 2004 budget on ICT from RM5 million to RM10 million for that project. As of November 2003, RM500, 000 was spent in the initial phase (New Straits Times, 17 November 2003). For the Community Learning House project, Microsoft (M) had provided RM 500,000 worth of software, including educational software, publishing tools and desktop software. Hewlard Packard had chipped in with 33 HP Vectra multimedia PCs' and 3 mid-range Intel-based HP NetServers worth RM 400,000.

Universiti Kebangsaan Malaysia Medical Virtual Library received RM2 million donation from the Lim Goh Tong Foundation for the initial set up cost and subsequently received RM50,000 for annual maintenance fee (Maimunah, 2008). Universiti Kebangsaan Malaysia's main library had embarked on a RM10 million digital library project started in 2002-2006. From the allocation, RM2 million was meant for digital library, RM2 million on books and RM8 million on e-journals. It spent about RM50, 000 annually on software for the library system and for creating web pages, portals and bibliographic databases (New Straits Times, 14 July 2003).

Esso Malaysia helped financially in the initial planning of Kuala Lumpur Electronic Memorial Library in 1998 (renamed Kuala Lumpur Library since 2004), donating RM52,000 for the purpose of buying computers and another RM5,000 to Kuala Lumpur City Hall to help design and produce multi-media software on CD-ROM (The STAR, 10 June 1998). The then Minister of Education, Tan Sri Musa Mohamad was reported saying that from the 8th Malaysian Plan, all library development projects including rural and mobile libraries would receive allocation for computer and other ICT facilities, a good indication for digital library development. The Federal Government had allocated RM13.5 million to assist public libraries in developing facilities and services, to achieve more widespread information access and helped close the urban-rural digital divide (New Straits Times, 1 March 2002).

2.2.8 Opinions of Information Professionals

The development of digital library that was made possible by the advances in ICT was most welcomed by the information professionals. "*Digital planet has arrived*," said Mr. Harris Miller, the former President of World Information Technology and Services Alliance (Miller, 2001). We could see that library could not progress in isolation; it had to embrace technology, as stressed by Secker (2004) that ICT had had an effect on all aspects of the library profession and the emphasis and current agenda was no longer on collection development but rather universal access of information. As Eugenie Prime, HP Labs Library Research Manager puts it *"Customers don't have to come here to be here. The library is wherever they are!" Own nothing. Maintain nothing. Access everything.* That's her mantra (Beckman, 2003).

As elaborated in the literature review, libraries around the world were taking advantage of the situation and had been actively transforming digitally their operations and services. Digital library undoubtedly promised to provide many social, economic, scholarly and technical advantages to the information industry (Iannella, 1996) and digital and online services had impacted the society more than we envisaged. The number of people accessing digital collections through the World Wide Web showed explosive rates of growth (Griffin, 1998). Sapp (2002) reiterated that the library profession had witnessed a spate of predictions over the last half-century on the fate of the library ranging from its immediate demise to its metamorphosis into sometimes recognizable and not so recognizable forms. If it was to be relevant in the 21st century, a library must not only acquired digital information but also lead other libraries in a collaborative, strategic effort to select digital information that was worth keeping, determined how to catalog it and decided how and where to archive it before it was lost forever (Fineberg, 2000). Summarized in a report *LC21: A Strategy for the Library of Congress*, he further reiterated that the digital revolution had upended expectations, expanded possibilities and posed breathtaking opportunities for libraries around the world.

Current digital libraries were very complex distributed systems (Duncker, Yin and Norlisa, 2000). The transformation from traditional to digital library had 'forced' information professionals to reposition themselves from providing access to repositories and services to undertaking massive digitization efforts of text, images and sound (Hanson and Levin, 2003). A library needed to be out at the frontier and rose to the challenge of creating new collections and services (Barnes, 2004). This was important because according to Jonscher (2000) we were now living in a wired world. Information

society was very much a real phenomenon and must be treated as such by those who were expected to engage with it (Dearnley and Feather, 2001). More crucially, governments and supra national bodies like the European Union and the United Nations perceived the existence of the information society and were making it part of their political agendas (McMenemy and Poulter, 2005).

Chiang (2004) regarded that library was at the center of a rapidly changing information environment. Librarians needed to be IT savvy. Whatever the future holds for libraries, the electronic/digital collections would need to be built. It was our existing professional skills in selection, acquisition and cataloging that placed librarians as the best qualified group to organize content, provided the challenge was recognized and accepted (Law, 2004). Even Inter Library Loan librarian had a local role to play, for example in license negotiation (Carrico and Smalldon, 2004).

The earlier literature review revealed that one of the fundamental elements of digital library development was collaboration that would enhance global access. This was supported by Griffin (1998) by saying that internationalization was making a global information environment a reality and most digital libraries were international (Witten and Bainbridge, 2003). Digital libraries were now very much a part of the library environment around the world whether viewed from a research or an operational perspective (Tedd and Large, 2005). Digital libraries had a major function to enhance our appreciation of or engagement with culture and often led the way in this new digital domain we found ourselves immersed within (Deegan and Tanner, 2006). Renda (2005) envisaged digital library not only as an information resource but also as a collaborative working and meeting space of people sharing common interests. Digital libraries were

here to stay and the conversion of traditional to digital was inevitable (Sharma and Vishwanathan, 2001). However MacColl (2006) was asking what happened to libraries if all books were available either for purchase or to rent, online?

The effect of digital environment was more visible in library and information centers globally as the libraries currently were not treated as the storehouse of books but considered as the gateway of knowledge resources (Kataria, 2007). Digital library *is* the library of the future. National Digital Library Program of the Library of Congress and the American Memory Project were important initiatives in this direction (Gian, Rekha and Moin, 2007).

Locally, the importance of digital library was being shared by the then Prime Minister Datuk Seri Abdullah Ahmad Badawi at the launching of *Perdana* Leadership Foundation Library in Putrajaya. He believed that the library made a good start towards this end by collecting, digitizing and archiving materials important to the nation (New Straits Times, 11 May 2005).

The then Mayor of Kuala Lumpur, Tan Sri Kamaruzzaman Shariff, said that the setting up of an e-library was in line with the government's effort to promote computer proficiency and allowing the public greater access to information technology. The role of libraries had changed to suit the needs of society. He was reported to saying that when commenting on the planning of the Kuala Lumpur Digital Library by 2005 (The STAR, 10 June 1998, p. 32). The then Director of Selangor Public Library Corporation, Datin Paduka Shahaneem Hanoum, said that the provision of an efficient library network, the quality of life among the reading population would be enhanced (New Straits Times, 17 August 2000).

2.3   Factors/Conditions Influencing Growth of Digital Libraries

2.3.1   Introduction

The development of digital libraries was dependent on many factors. Digital library projects were complex, expensive and required long term planning. Effective project management including managing budgets, staffing, workflow, determining technical specifications and metadata creation was vital for a successful digitization project (Lopatin, 2006). Two strong forces were driving the day-to-day development of the digital library: rapidly advancing technological capabilities and the ever increasing expectations of users (Ochs and Saylor, 2004). Deegan and Tanner (2002) projected that any digitization project would involve some or all of the following activities:-

i) Assessment and selection of original materials ii) Feasibility testing, costing and piloting iii) Copyright clearance iv) Preparation of materials v) Digital capture vi) Quality assessment vii) Metadata creation viii) Disseminate (public domain / private domain). Other than the variables discussed above, what follows were several other contributing factors or conditions that were of equally important.

2.3.2   Digital Library Research Center

The importance of digital libraries could be felt when some countries took the initiative to establish digital library research centers and many of these were led by the universities. In the United States, examples were Center for Intelligent Information Retrieval, Center for the Study of Digital Libraries , Center for Electronic Texts in the Humanities , Center for Research on Information Access , The Electronic Text Center at the University of Virginia, The Information Infrastructure Project and Rutgers Center for

Information Management, Connectivity and Integration (http://www.dlib.org/projects.html) and Rutgers Center for Information Management, Integration, and Connectivity (Chowdhury and Chowdhury, 2003).

There was also Center for Digital Research in the Humanities, a joint initiative of the University of Nebraska-Lincoln Libraries and the NCL College of Arts and Sciences (http://cdrh.unl.edu/) and Center for Digital Research and Scholarship of the Columbia University (http://cdrs.columbia.edu/). University of Nebraska-Lincoln Center for Digital Research in the Humanities and University of Utah's Marriot Library was responsible for maintaining DLIR (Digital Library for International Research). Grainger Engineering Library Information Center, University of Illinois at Urbana-Champaign had started several digital library research projects, which began as early as 1994 as part of the DLI-1 project (Mischo, 2004); (http://dli.grainger.uiuc.edu/),

In the United Kingdom, the *eLib* program was more of a practice-based library research (Brophy, 2001). Center for Digital Library Research at Strathclyde University in Glasgow brought together long standing research interests in the digital information area (Chowdhury and Chowdhury, 2003). Another research project was the Institutional Repository Infrastructure Scotland Project, to develop an internationally interoperable framework for a distributed institutional repository infrastructure (http://www.iriscotland.lib.ed.ac.uk/).

The importance of digital information architecture was demonstrated by a research project for the China Digital Museum Project, partnered by Beihang University, the Ministry of Education, Hewlard Packard Company and several Chinese universities (Tansley, 2006). In India, the Department of Library and information Science, University

of Mysore had developed *Vidyanidhi* Digital Library*,* a national digital repository for Indian ETD (http://210.212.200.226/) (Shalini, 2003) and was an information infrastructure, a portal of resources, tools and facilities for doctoral research in India (Ashraf and Anand, 2007) that would eventually emerge as a distributed input and database environment for the ETDs Digital Library (Fox, 2004).

It could be seen from the above examples that the establishment of a center for digital library research was in fact one of the mechanisms to accelerate digital library initiatives. As a result of digital library research in the United States, United Kingdom, and Europe and in other parts of the world, a number of digital libraries had been established during the past ten or so years (Chowdhury and Chowdhury, 2003).

2.3.3   Human resource

Morgan (2001) highlighted the importance of incorporating the human factor and learning new skills and increasing collaboration with technical specialists (Wells, Carcari and Koplow, 1999) and the importance of providing internships in working digital library programs (Brancolini, 2006). Conversion to digital environment would involve massive exercise. As had been elaborated and emphasized earlier under 2.2.6 Training, working procedures, digital policies, and users' education programs must be carefully planned and executed and staff training was a key component of change management (Hughes, 2004), playing the part of teachers, gatekeepers and content creators (McMenemy and Poulter, 2005). Krisnamurthy, (2005) thought that to create true digital libraries, not just digital collections, would require librarians to work closely together to create an open,

distributed, publicly accessible resources and to establish a collaborative structure to coordinate and guide implementation.

The element of human resource was one of the factors that had contributed to the success of Compaq Computer Corporation's *WebLibrary,* through the ability to work together as a team between the IT people and the library experts (Pack, 2000). Another example was the Cuneiform Digital Library Initiative, representing the team effort of an international group of Assyriologists, museum curators and historians of science to make available online, the historic cuneiform tablets (http://cdli.ucla.edu/).

2.3.4 Blueprint

The importance of blueprint for digital library development was indeed crucial. There had been numerous blueprints such as Collection Development Blueprint (http://nsdl.org/collection/blueprint.php), Blueprint for Broadband, Blueprint for Action to Improve Bibliographic Control of the Web, Blueprint for High Resolution Image Files and Blueprint for Preservation System. On top of this, the Museum, Library and Archive Council, United Kingdom had published *A Blueprint Excellence: Public Libraries 2008-2011* (Dolan, 2007) to charter the growth of United Kingdom's public libraries till 2011.

The University of South Florida initiative towards digital library project in September 1995 on the other hand began with the formation of Virtual Library Planning Committee and their efforts culminated in the production of the *"USF Libraries Virtual Library Project: A Blueprint for Development"* in July 1996, organized into 4 sections: Services; Collection and content; Interface and Organizational structure (Hanson and Levin, 2003).

2.3.5   National Information Infrastructure

The importance of national information infrastructure (NII) must not be overlooked as the number of people using the Internet had increased dramatically because of the widely accepted web environment. It included more than just the physical facilities (more than the cameras, scanners, keyboards, telephones, fax machines, computers, switches, compact disks, video and audio tape, cable, wire, satellites, optical fiber transmission lines, microwave nets, switches, televisions, monitors, and printers) used to transmit, store, process, and display voice, data, and images (Wikipedia, 2007).

As an example, the NII of the United States was to create a national communication environment, creating an infrastructure offering advanced information services to all Americans. They would benefit from the services by being able to get access to information databases, libraries, health care services, entertainment, and educational training. (http://www.w3.org/People/howcome/p/telektronikk-4-93/nii.html). Virtually all (99%) United States public libraries provided free public computer access to the Internet, compared to 25% 10 years ago (ALA, 2007).

Similarly *Digital Britain: the Final Report* contained actions and recommendations to ensure first rate digital and communications infrastructure that would support digital library development of the country (http://www.culture.gov.uk/what_we_do_broadcasting/6216.aspx). As for Germany they were working towards creating open access infrastructure for the country (Muller, 2009).

2.3.6 Collaboration

The development of digital library had witnessed the intensification of collaborative efforts among all types of libraries worldwide. It became a vibrant economic discipline with computer scientists working alongside economists, sociologists, lawyers and librarians. An interdisciplinary body of expertise was emerging (Ali, 2003). Kranich (1999) advocated the needs for the global library community to collaborate to develop a shared vision, to build an organizational structure to implement that vision, a funding model to sustain it, thus avoiding redundancies and taking advantage to each other's expertise and strong collections owned by one institution but lack by another.

This was further stressed by Bunker and Zick (1999) on the importance of collaboration including the unique and complementary roles of collaborating partners. Since digital library operated on distributed and decentralized systems, collaboration was far more demanding. As the potential of digitization around the world expanded, the importance of collaboration was becoming clearer (Hughes, 2004), as exemplified by the Library of Congress's 5 million digital items from the *American Memory Project* that came from 80 different libraries and institutions throughout US (Griffin, 1998).

A digital library broke down old borders, making the building of digital library very much a team effort (Ochs and Saylor, 2004). It meant the development of a common new mission and goals, long-term projects, new organizational structure, more comprehensive planning, mutual control, intensive resource-sharing, mutual agreement on intellectual property rights, democratization of information, more joint-ventures and a better agreement on online license procedures. Today no single institution or platform could reasonably claim to offer substantial value without cooperating. New and

increasingly complex distributed platform were built around key concepts like cooperation, federation and virtual aggregation of services and resources (Castelli and Parker, 2009).

Kranich (1999) further suggested that libraries must participate in the numerous discussions about the development of digital libraries, learn more about the complex challenges of digitizing materials, ready to take risk and get involved with political, legal and social issues. The result of all of the above was what had been called digital convergence (Levy, 2003). The German Research Foundation had developed data capture centers and was in the process of developing an organizational framework to ensure that results about the process of digitization were shared around rather than developing their knowledge and tools separately (Dunning, 2007).

In the United Kingdom, the British Library/JISC Partnership was established in 2004 to carry forward and developed earlier collaborative activity between the British Library, the JISC and UK Higher Education. (http://www.bl.uk/about/cooperation/jisc.html); (http://www.jisc.ac.uk/part_bl_info.html) The British Library and JISC were both heavily involved in the development of digital library and joint partnership activities (Beagrie and Bruce, 2006). As an example, JISC Digital Repository Program 2005-2007 brought together a diverse group of repository projects nationwide (Manuel and Oppenheim, 2007).

Examples of collaboration were plenty. The International Children Digital Library project by 2008 had 100,000 books in its collection in over 100 languages, working closely with the national libraries of New Zealand, Mexico and Germany, government agencies, public library systems, publishers, individual authors and illustrators

(www.icdlbooks.org). The European digital library was a European Union cooperative network that had contributed enormously to its success in its pan European role. The full participants were the libraries of Austria, Croatia, Denmark, Estonia, Finland, France, Germany, Italy, Latvia, The Netherlands, Portugal, Serbia, Slovenia, Switzerland and the United Kingdom. Added during 2006 were the collections of the libraries of Czech Republic, Hungary, Latvia, Lithuania, Poland, Russia, and Spain and by 2007 the remainder of the European Union libraries. This meant that the European Library Portal should be able to access at least 30 of the 45 member libraries by 2007 (Cousins, 2006).

World Treasures Project by the National Library of Australia (http://www.nla.gov.au/worldtreasures/html) was another truly international collaboration, sponsored by Singapore Airlines, Novotel, Art Indemnity of Australia and the Commonwealth Bank. The recent opportunities to work with the private partners such as Google and Microsoft had opened up possibilities that were unimaginable just a few years ago (Kaufman and Ubois, 2007).

Collaboration between national and heritage information agencies was another avenue for consideration, as librarians and archivists need to work together (Erway, 1996). Libraries, museums and archives were creating multilingual and multicultural digital content at a dramatic rate (Hughes, 2004). The principles underlying digital libraries as well as their practical manifestations were not only to institutions that called themselves libraries but also archives, museums and art galleries (Tedd and Large, 2005). Digital libraries contained time-based media, images, quantitative data and a far richer array of content than print, with visualization technologies blurring the boundaries between library and museum (Crane, 2006). They were digitizing their resources and

services on large scales (Ashraf and Anand, 2007) and since the mid 1990's archives had greatly expanded their online information and sources (Anderson, 2008).

Canada manifested a good collaboration between libraries, archives and museums. As of 2005, the Inventory of Canadian Digital Initiatives contained 309 projects from 360 organizations from every corner of Canada. A breakdown of these participating organizations showed libraries at 49%, archives at 24% and museums at 9% (Landriault, 2006). In Colorado, the Collaborative Digitization Project was a collaboration of cultural heritage institutions (libraries, archives, historical societies and museums) and other western states to increase access to their unique resources through digitization (Lopatin, 2006). Another example was the New Jersey Digital Highway, a one stop shop for New Jersey history and culture, from the collections of New Jersey libraries, archives and historical societies (http://www.njdigitalhighway.org/), and the Connerstone Project, a collaborative effort to digitize historical materials in Alabama's libraries, archives and museums. Funded by Institute of Museum and Library Service grant, digital projection centers were established at Auburn University and the University of Alabama (Downer, 2005).

In the United Kingdom, the Museum Library Archive Council provided leadership, promotes standard and aimed to tap the overall potential for collaboration. United Kingdom's National Archives (http://www.nationalarchives.gov.uk/) brought together the collections of the Public Record Office and the Historical Manuscripts Commission to form one of the largest archival collections in the world (Tedd and Large, 2005). A research was done on the theory regarding library museum collaboration and also on public library museum collaboration in England and the United States. The result

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showed that museum library collaboration had been happening successfully and the study clearly demonstrated that there were considerable benefits from library museum collaboration (Gibson, Morris and Cleeve, 2007).

Licensing electronic media might be best done through consortia arrangements, (Johnson, Reid and Newton, 2004) and consortia of libraries worked together to provide access to digital library resources (Ochs and Saylor, 2004). Libraries in Korea had formed a consortium, the Korea Electronic Site License Initiative (KESLI), operating under the National Digital Science Library project, to build a national digital library providing a one-click total gateway to foreign scholarly information. As of July 2005, the total number of KESLI consortium members amounted to 396 institutions, composed of academic, research, medical, corporate, and public libraries (Chae, Park and Choi, 2006).

Other than a consortium, the creation of scanning centers was another option as practiced by the Digital Library of India in establishing a network of 4 mega scanning centers and 21 scanning centers, which fed the digital contents into the digital library systems (Balakrishnan, 2005) as part of the Universal Digital Library and Million Books Project. World communities had appraised Indian efforts (Ghosh and Das, 2006) and it also played a crucial role in the SAARC (South Asian Association for Regional Cooperation) for the development of digital libraries (Das, Dutta and Sen, 2007).

2.3.7 National Digitization Policy

National digitization policies and infrastructure were of extreme important to be first laid out to ensure that planning would be guided, coherent and well executed. Australia's digitization efforts were supported by the National Strategy for Provision of

Access to Australian Electronic Publications 1996; Electronic Information Resources Strategies and Action Plan 2001-2002; Digitization Policy 2000-2004; and National Library Australia's Directions for 2006-2008 that specifically highlighted digitization as one of its strategic planning.

Canadian Initiative on Digital Libraries had released their 2006 Work Plan, through which their efforts in advocating a national digital strategy would be strengthened. Singapore's IT 2000 Plan that outlined a strategic vision to develop National-Information Infrastructure, and Library 2000 Plan that called for the transformation of library services throughout the country (Reid, 1996) were fundamental to the development of digital libraries in Singapore.

The British Library Digital Development Plan was well spelt out in its Strategic Plan 1999-2002, together with the *New Library: The People's Network* public library initiative that led to all United Kingdom public libraries being provided with PCs and Internet services (Great Britain. DCMS, 2003), (McMenemy and Poulter, 2005). In the United States, *Building a National Strategy for Preservation Issues in Digital Media Archiving* was published in 2002 by the National Digital Information Infrastructure and Preservation Program, Library of Congress and the Council on Library and Information Resources.

The National Library of Norway that planned to digitize its entire collections had come out with three strategy documents. The first was the *Digital National Library-Strategy Manifesto 2005*, followed by second strategy document *Access to Digital Content in the National Library Strategy Document for the Digitization of the National Library's Collection* and thirdly the strategy document *Digitization of the National*

Library's Collection (Takle, 2009). Therefore, there was a need to make a consistent national policies and procedures for the creation and management of digital libraries (Mahesh and Rekha, 2008).

2.4   Summary from Literature

From the literature review, it was clear that the developments of digital library had been widespread, and the topic had been much talked about, discussed and written as summarized in Table 2.1 below thus making it the library of the future. Professional librarians were taking full advantage of the benefits technologies had to offer. Digital library projects were indeed big undertaking, heavily technology dependent, requiring proper planning and huge budget, technical skills and expertise, time consuming and needed full government and private organizational supports in terms of funding, policies and infrastructure and collaboration.

The literature of the 1990's was no longer reporting on the normal library processes such as acquisition, cataloging, circulation, bibliographic control, interlibrary loan, and reference works but were reporting on digital library initiatives and anything that was related to it. We were in the transition period from the traditional library to global digital library phenomena. The idea was to provide universal access to digital content available only in a digital library environment (Patra, 2006).

Libraries boundaries were diminishing and the concept of disintermediation was becoming clearer. It was remarkable that how many digital library initiative projects from the last 40 years had made the transition. There was a panorama richly populated with real services delivering information to literally millions of users scattered across the

cyber oceans of the world (Brophy, 2006), resulting in many digital library conferences such as *Digital Library Forums* that provided an opportunity and to support a broad level of information sharing between professional and staff (Riggs and Tomren, 2007).

In Malaysia, having started library automation and transformed electronically, the libraries had started developing digital library initiatives to some extent. The birth of digital or virtual libraries (both terms were used), though independently, such as Tan Sri Abdullah Sanusi Digital Library (Open University Malaysia), Tan Sri Lim Goh Tong Medical Virtual Library (University Kebangsaan Malaysia), Tun Dr. Hasmah Virtual Library (Multi Media University), *Portal Ilmu* (Ministry of Information), Malay Civilization (Institute of Malay World and Civilization, University Kebangsaan Malaysia), MIMOS Digital Library and the National Library of Malaysia's national digital library initiatives *PERDANA / MyLib* were a proven fact that Malaysian libraries were in actual fact moving toward digital library development.

Table 2.1 SUMMARIES FROM LITERATURE

Digital Library Initiatives by international organizations	- National Libraries of G7 - Bibliotheca Universalis - European National Libraries - IMESH - UNESCO - Memory of the World - UNESCO and IFLA - Survey on Preservation and Digitization - World bank - E-Library Service - European Union - CANDLE/DECOMATE/DEBORA - European Commission - I2020 project/ COINE - International Council of Museums - VLmp - Other projects: - Fathom.com, HP DL, WebLibrary, HUMI Project, IDP, China-US Million Book Project, Cuneiform DL, African Online DL, West African DL Network, Tibetan and Himalayan DL
Digital Library Initiatives in selected countries	- Initial surveys and pilot projects - Collaboration - Universities were pro-active through research projects - Central planning and well out digital policies and infrastructure - Central committee through task force and working groups - Developing digital library models and prototypes - Availability of funding: government and non-government/private sectors - Interdisciplinary subject coverage - National, regional and international

Digital Library Initiatives in Malaysia	• Localized • Done independently • Minimal collaboration • Limited funding • Minimal digital library research • Over dependent on PNM for collaborative efforts • Predominantly private domain • Universities DLIs mainly to support learning and documentation • Public/state libraries initiatives inclines toward institutional memories • No mentioned about DLIs in schools
Research on Digital Libraries	• Information storage and retrieval • Multi Lingual Digital Library • Interoperability • Collaborative DL working environment • Multi cultural DL environment • Repositories • CDLR • Data mining • Digital content • User interface • Metadata • DL framework
Digital Library Related Problems	• Inter disciplinary collaboration • Lacked of standard and consistency • Lacked of coordination and implementation mechanism • Stable funding • Technical infrastructure and unified framework • DL system integration • Networking strategies • Expensive license agreement • Scarce of technical expertise and training • Digital ownership and preservation • Evolving and unstable metadata environment • Copyright law • Interoperability

Library Collections, Operations and Services	• Digital based and Global access • Ownership at stake • Digital subscription • Digital storage and retrieval • Born digital materials • Interoperability • Virtual service delivery / Virtual Reference Service • Establishment of repositories • Hypertext linkages • Collection development policy • Distributed information resource
Training	• Pre-requisite • Digital library creation and management • In house expertise • Interdisciplinary of expertise (various disciplines) • Train and re-train • Learn and re-learn • Exposures to latest digital technology
Budget	• Important requirement • Government support grant • Non-governmental support grant/private sector • Huge investment • Costly (inclusive of maintenance) • Collaborative fund / grant
Opinions of Information Professionals	• DL is library of the future • Global / universal access is the trend • DL had huge impact on society • Increase in collaboration and strategic efforts • DL is a complex distributed information system • Repositioning of the profession • Information Professionals to be IT savvy • Internationalization of library concept • Libraries as gateways • Open up for resource sharing

Conditions Influencing Growth of Digital Libraries	• Digital Library Research Center • Human resource • Training/Expertise • Blueprint • Technological capabilities • National Information Infrastructure (NII) • Collaboration • National digitization policy • Budget • Government support • Effective project management • Expectation of users

2.5   Framework for Study

Literature review on digital library developments worldwide had disclosed some prominent points as below:

a) Digital library *is* the library of the future, characterized by e-resources, distributed information resources, dematerialization of library materials, global resource sharing and universal user based. The key concept was the provision of access to digital information and linkages to relevant websites worldwide.

b) Digital library researches had been extensively carried out especially at universities and organizational levels.

c) Digitization programs were carried out extensively at all levels, national, regional and international, by libraries, archives, museums, universities, governmental organizations and private institutions.

d) Digital library initiatives were more than just information surrogates and subscription to commercial online databases.

e) Special subjects or disciplines and rare materials had been given priorities together with the digitization of the national heritage.

f) Financial supports were available from the governments, foundations and private institutions / corporations.

g) All of the coordinating and facilitating digital library initiatives and projects were done on collaborative efforts, thus ensuring resource sharing and virtual re-unification of digital resources.

h) Understanding of digital library issues and several main issues related to digital library had been worked out, specifically relating to the actual definition of what constitute a digital library, preservation of digital objects, ownership, copyright and intellectual property rights, multi lingual digital library, interoperability, and the expansion of legal preservation to include digital objects.

i) Literatures and publications on digital library endeavor, reporting the research, planning, monitoring of digital library projects, status and success of foreign digital library undertakings were many, reflecting a tremendous increase in networking and inter-organizations collaborations of different expertise and backgrounds.

j) The success of digital library development was dependent on several conditions / factors that must co-exist especially on the human aspect, technology and resource factors.

However the above framework would not be able to be fully applied into the Malaysian scenario due the low level of development in library sectors (Ahmad Bakeri, 2007) and low level of digital library development, as reiterated by Kiran (2006) that they were just embarking on the journey to the digital world. Based on the working definition given in Chapter 1, where Malaysian digital library development would include some aspects of library automation and electronic resources, and equipped with some background knowledge derived from discussions and meetings with as many librarians at every possible opportunity at the initial stage of the research, the operational research framework for this study would cover six main areas that would enable us to gauge their readiness in terms of transforming from traditional, to electronic and then to digital libraries.

a) **Demography**. Covers background information that included library type, qualification, working experience and grade of library heads, provision of e-mail, intention to be full fledge digital library by 2010 and the number of years the library had been established. Background information co-related because digital library development required a strong leadership in terms of knowledge, expertise and experience. Digital library development *is* knowledge based and hence the people handling it must be information professionals and IT savvy. This section would also be able to give an overview of the library's present strength and perception as whether they perceived themselves as digital, hybrid or print based library.

b) **Library holdings**. Digital library brought the connotation of either paperless (reduced) or paperless (zero based) situations. Since all Malaysian libraries were originally print based, the study would find out how much had they transformed from analogue to digital and what was the most favored new information storage media. Digital library had affected collection development practice, as many of them now resorted to subscribing commercial online databases and e-journals. The degree of changes in terms of library holdings would somehow reflect the degree of digitization that had been done.

c) **General and digital library related problems**. Attempts to discover the various kinds of problems that Malaysian libraries were facing. Digital library could be considered as one step higher than the traditional library set up. Some of these were problems related to staffing, IT personnel, training, budget, leadership, IT facility, collaboration, renewal of data base subscription, library system, vendor support and utilization of digital resources.

d) **Automation**. Library automation was considered as the preliminary step before embarking on a bigger endeavor. From a Malaysian perspective it was very unlikely that a library would venture into digitization without first becoming automated and electronic. The study would find out if libraries had installed integrated library system, prior to becoming digital.

e) **Digitization projects.** Digital library initiatives were the main concern. The study would like to gauge how far had Malaysian libraries responded to this new digital library phenomenon from several perspectives such as digital library

operations and services, digitization, future planning and perceived conditions for digital library future growth.

f) **Opinion of head of libraries**. Digital library development depended to a certain degree on the people handling it, specifically the librarians. The future of Malaysian digital library rested in their hands. The study would explore their thoughts and understanding on the subject matter.

In view of the degree of digital library development in Malaysia, the operational digital library initiatives (DLIs) research framework is shown in Figure 2.1 (a and b) below:
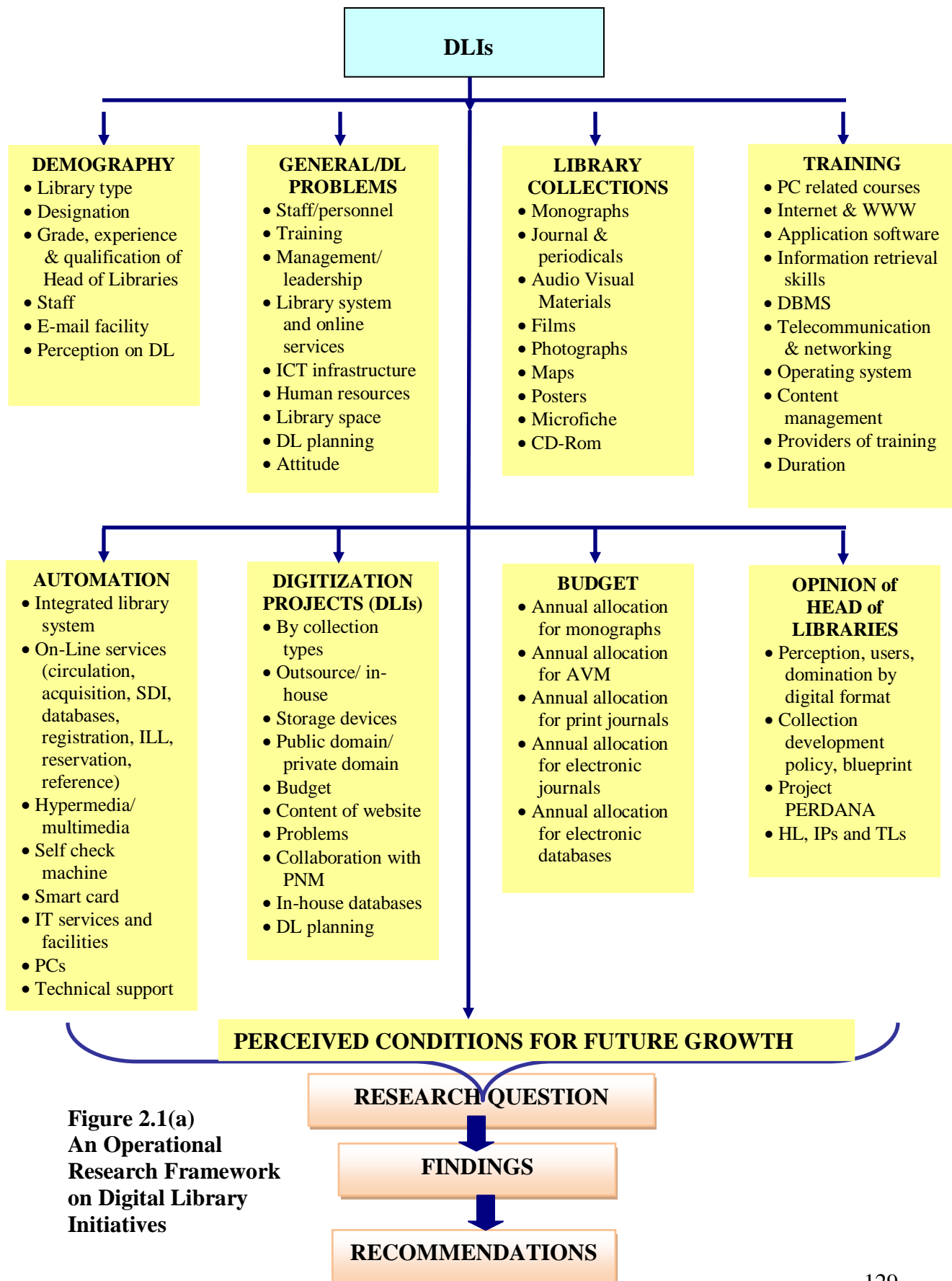
DLIs

DEMOGRAPHY
- Library type
- Designation
- Grade, experience & qualification of Head of Libraries
- Staff
- E-mail facility
- Perception on DL

GENERAL/DL PROBLEMS
- Staff/personnel
- Training
- Management/ leadership
- Library system and online services
- ICT infrastructure
- Human resources
- Library space
- DL planning
- Attitude

LIBRARY COLLECTIONS
- Monographs
- Journal & periodicals
- Audio Visual Materials
- Films
- Photographs
- Maps
- Posters
- Microfiche
- CD-Rom

TRAINING
- PC related courses
- Internet & WWW
- Application software
- Information retrieval skills
- DBMS
- Telecommunication & networking
- Operating system
- Content management
- Providers of training
- Duration

AUTOMATION
- Integrated library system
- On-Line services (circulation, acquisition, SDI, databases, registration, ILL, reservation, reference)
- Hypermedia/ multimedia
- Self check machine
- Smart card
- IT services and facilities
- PCs
- Technical support

DIGITIZATION PROJECTS (DLIs)
- By collection types
- Outsource/ in-house
- Storage devices
- Public domain/ private domain
- Budget
- Content of website
- Problems
- Collaboration with PNM
- In-house databases
- DL planning

BUDGET
- Annual allocation for monographs
- Annual allocation for AVM
- Annual allocation for print journals
- Annual allocation for electronic journals
- Annual allocation for electronic databases

OPINION of HEAD of LIBRARIES
- Perception, users, domination by digital format
- Collection development policy, blueprint
- Project PERDANA
- HL, IPs and TLs

PERCEIVED CONDITIONS FOR FUTURE GROWTH

RESEARCH QUESTION

FINDINGS

RECOMMENDATIONS

**Figure 2.1(a)
An Operational Research Framework on Digital Library Initiatives**

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PERCEIVED CONDITIONS FOR FUTURE GROWTH

o Digital Library Research Center
o Human resource
o Training
o Blueprint
o Technological capabilities
o National Information Infrastructure
o Collaboration
o National digitization policy
o Funding / Budget
o Government and non-governmental supports
o Effective project management
o Expectation of users

Figure 2.1 (b)

2.6   Conclusion

To conclude, digital libraries were in the making around the world. From the creation of the oldest commercial digital library systems – Lexis and Westlaw (Lynch, 2003) to the launching of *World Digital Library* in 2009, attempts at local, regional and international levels had been continuous and numerous.

Having elaborated and discussed the scenario of digital library initiatives in some of the countries, including Malaysia, what follows in the next chapter would be on research methodology. Chapter 3 elaborated the mechanism on research design and data collection methods to find answers to the set research objectives.