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MicroUse Information

## *GLOBAL DIGITAL LIBRARY: Technology Is Ready, How About Content?\**

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The widespread global use of the open systems like Internet and World Wide Web (WWW) make it possible for us to experience the reality of all types of "virtual libraries" in the cyberspace. Thus, the "Global Digital Library" (GDL) advocated by the author for a number of years can be a technological reality. Yet, because of the complex and diversified logistical and non-technological problems and issues, many hurdles must be jumped over in order to witness a functional GDL.

While recognizing the importance of many other information infrastructure related problems and issues which are more global in nature, librarians need to be actively participating in working together with other groups in meeting the digital and global challenges. With her own GDL initiative, this author shows how the current seamless GDL prototype has the capability to link many national libraries and some major libraries, archives, museums, and information organizations together. Yet, while technologically the system building is possible, we need to raise a basic question about the readiness of digital "contents" for this global connection. Are we ready to utilize the available global system?

Unquestionably, there is an urgent need for global cooperation in "digital" content building and sharing. Being digital with substantive knowledge content will be the key to a successful GDL. This will be global challenge for librarians at a very tall order!

### *I. INTRODUCTION*

Years ago, futurists like Toffler predicted the coming of a shrinking global village, and today, we are experiencing the true meaning of such a shrinking globe. Caught in the midst of the digital visual information age, excited in both the great technological potentials and the current development of the global telecommunications networks, it is easy to envision the coming of a true "Global Digital Library" (GDL). It is this "Global Library" and its impact on feasibility for universal information access that I have chosen to address.

\* In recent years, I have worked hard to push the Global Digital Library Initiative which stresses the importance of "content". This year alone, I have offered a number of keynote speeches on the topic in different parts of the world as well as articulated my views in a number of publications. In continuing this initiative, this paper will be based heavily on two keynote speeches entitled "Global digital library and universal information access," delivered at the First China-US Conference on Global Library, Beijing, China, August 23, 1996 and "New tasks and new opportunities for libraries in the digital environment," delivered at the Societal Science Divisional Meeting at IFLA Meeting, Beijing, China, August 28, 1996. My most recent article, "Global Digital Library Initiative: Prototype development & needs," in the special issue of *Microcomputers for Information Management* (June 1996) is also a major source for this paper. In continuing this initiative, with permission, this paper will incorporate a good parts of the above sources.

### 1.1. An Era of Unprecedented Change

In this last decade, the technological, social and economic changes have been particularly dramatic. Technologically, with the advent of microcomputers, optical discs and other mass storage media, telecommunications technology, digital image technology, computer graphic technology, multimedia technologies, compression technology, etc... have dramatically changed the way we live, think, and communicate with each other, and certainly the way we use and view technologies.

In the last couple of years, the development in communications technology has been so dramatic that we are truly experiencing the incredible power of the open system, Internet. The new technology buzzwords everywhere have been global village, electronic or digital information superhighway, information age, cyberspace, electronic frontier, virtual village, etc... In addition, communications satellites, global trade and investment, and global technology transfer have prompted dramatic social and economical changes as well. These have pushed the national economies into a more integrated world economy. Now, more than ever, as many political barriers removed, we have been able to communicate with each other openly and freely.

### 1.2. Telecommunications, Internet and Universal Information Access

Since 1960s, we have passed several computer eras -- from the mainframes era in the 1960s to the minicomputers era in the 1970s, to the PCs era in 1980s, and finally to the networks era of the 1990s. The main player of this networks era is the Internet.

Internet started in 1969 by the US Defense Department with its humble beginning and once was exclusively used by American research scientists and computer specialists for e-mail, group discussion and conduct research. But, during this current networks era, it has greatly expanded to become a supranational global digital information superhighway. This global communications network connects networks of federal, regional, academic, private, and foreign users. It is a network of more than 50,000 networks that form the world-wide web. Its membership doubled in 1993 to more than 15 million users, and current estimates put Internet users world wide at much more than 40 millions, but the number is increasing dramatically--as commercial online services, such as American Online, Prodigy, and Delphi, get their browsers up and running. It is expected that by year 2000 there will be over 200 million users. There are endless examples illustrating this fast moving networked environment. Let me mention only two examples: American Online (AOL), the largest provider of online and Internet services in the world, has now over 5.5 million members with 900,000 new subscribers in the first three-month period of 1996 as reported by AOL. In February 1996, Steve Case, the CEO of AOL, said, "AOL is now among the largest 'cities' in the world; more people live in the AOL community than in the metro areas of San Francisco, Madrid, or Sydney." Netscape Communications Inc. with its most popular Internet browser, reported its magical growth with an installed base of more than 38 million users. In addition, the Netscape web site receives 80 million hits per day and has served more than 10 billion hits since its launch in 1994. Clearly the WWW has opened a new distribution channel for whatever types of information electronically published in the cyberspace.

### 1.3. Shift Toward a Global Learning-Oriented Society

With all the unprecedented changes, it should not be surprising that there is an increasing demand for better access to needed global information to enable us to have a bigger picture on the world in which we are living in, a better global view on our environment, our history, our cultures, our economy, our science and technology, etc... Thus, information, has become the key to productivity, and there is a shift toward a knowledge-based learning-oriented

"creative society." In this type of society, we are witnessing the following change in emphasis:

- Societal values change from "acquiring" to "learning"
- Growing motivation of individuals for knowledge
- More people learn to use information creatively
- More demand for multimedia information
- More demand for global information
- More demand for opportunities to interact, to learn, and to engage
- More demand for community than for just information

It is clear then that a changing society characterized by continuing technological progress, societal and economic changes will definitely pose new challenges to libraries. It demands our libraries to transcend traditional methods of providing information access within the confines of library's physical structures to providing access to services and global information resources to people at home, in school, at work, or any place so desired by them [Chen, 1994].

## 2. THE GLOBAL DIGITAL LIBRARY: REALITY AND CHALLENGES

Because of my active project involvement in interactive multimedia, optical and digital technologies since the early 1980's, it has been easy for me to visualize the potential possibilities for libraries with the coming of the digital visual information age. Thus, for years I have advocated the coming of digital libraries (Chen, 1986; Chen 1990). In the latest few years, the fast-paced development in the expanded use of the Internet for digital publishing on the World Wide Web (WWW) for both commercial and noncommercial purposes has been explosive. Clearly, with the ability for us to talk, write, confer with, or send textual, audio and visual information to anyone else in any part of the world, the landscape for information and for library and information services provision and delivery has changed dramatically. Instead of talking about networking and automation, we are talking about the reality of digital libraries, and the delivery of information over cyberspace (Chen, 1995a, p. ix). But, this is only the beginning. We should also be talking about the provision of a global virtual community for more substantive engaging experience around the knowledge gained. In this respect, I am so very pleased to have the paper by Borbinha and Delgado (1996) to be presented at this conference, which has saved me a great deal of page space to discuss the impact of the Internet and the future new library.

### 2.1. Toward Universal Information Access

As computing and telecommunications develop and merge, we have moved closer toward universal information access. This means that technologically, anyone, anywhere, could talk, write, confer with, or send multimedia -- textual, audio, and visual -- information to anyone else in any part of the world, provided these information sources are digitally available! So, the concept of the digital "Global Library" is both conceptually sound and technological feasible now. Yet, we seem to be still a long way from having this kind of universal library on the open system with access to global information resources which include the collections of the world's greatest libraries as well as others resources. We still need to pass many hurdles before we can reach this goal. What are these hurdles or barriers then?

### 2.2. Obstacles to Universal Access

On May 18, 1994, on my way to Moscow and then Crimea '94, I was reading an interesting feature article appearing in the *Wall Street Journal* (Ziegler, 1994) entitled "Building the

Highway: New Obstacles, New Solutions." Ziegler stated that in order to deliver the promises, many challenges of unprecedented complexity and size will have to be met. These include areas related to data compression and storage, the servers, the conduit, the set-top box, the user interface, and the ordering and billing systems. Surprisingly, in short two years, most of those related to technical issues and programs have come closer to have possible solutions. Yet, the real barriers are generally not technical ones. They have a lot to do with the problems and issues related to the information infrastructure. As included in those identified in *Alexandria Declaration of Principles* (see Appendix 1), resulted from the *NIT '94: International Conference on Planning Global Information Infrastructure* (Chen 1995), many barriers include those unsolved or difficult to solve issues such as:

- legal issues which arise with respect to copyright, intellectual property, privacy and confidentiality, personal and business equity, and security;
- the differences in culture, especially as reflected in the means for communication;
- generational gaps;
- the sheer complexity of information infrastructure -- global or national;
- adequate and effective inventory of available information resources that constitutes knowledge of information;
- ability to locate and retrieve quality and relevant information;
- the complex issues related to "undesirable" "indecent" information; etc...

The bottomline is that despite of these problems and unsolved issues, the skepticism on the hype and reality of our interactive future, one thing is very sure. With all the money bumping into this effort by big-time players, we will have a digital superhighway. Yes, the technologies will be soon available to enable us to link all the global information together to form "The Global Library" for multimedia information delivery. But, are we ready to have our information resources available in digital form so that they can be linked together by utilizing the available technologies? All the products and services which attracted BIG investments in billions and millions of dollars are now related to the delivery of popular, game-like, and entertainment type of products. If so, is this digital information superhighway, which we are so much looking for, is more suitable to be called digital *entertainment* highway? To prevent this, information professionals like us need to build our own high-speed quality "cars" to ride on this highway. These are the new tasks. Here, for "high-speed," I mean "digital" or "electronic", and "quality," I mean content-based and knowledge-based, as well as multimedia and not just print-based. Have we begun to think about this and to plan to build this? This is the central question! It is high time for all information professionals, to think seriously on how to work toward that!

### 3. GLOBAL DIGITAL LIBRARY INITIATIVE

My long-time international involvement has prompted me to consider the information infrastructure development from a global angle. I have capitalized all possible opportunities opened to me throughout the years to present my concept of "Global Digital Library" (GDL). In one of my latest articles in *Microcomputers for Information Management: Global Internetworking for Libraries* (Chen, 1996), many of my intensified efforts in the last three years were detailed. These include:

- Presenting major speeches at several international meetings including
  - *Crimea '94* in Eupatory, Ukraine, organized by the Russian National Public Library for Science and Technology and the Ukraine Ministry of Culture,
  - the *NIT '94: The 7th International Conference on New Information Technology* in Alexandria, VA in November 1994;

- the *NIT '95: The 8th International Conference on New Information Technology* in Riga, Latvia in November 1995;
- the First China-US Conference on Global Library, Beijing, China, August 23, 1996
- the Social Science Divisional Meeting at IFLA Meeting, Beijing, China, August 28, 1996, and now
- the *NIT '96: The 9th International Conference on New Information Technology* in Pretoria, South Africa.

Clearly, this series of *NIT* conferences have played very key roles in my efforts to interact with library and information professionals from different part of the world.

#### • Organizing High-level International Brainstorming Sessions

- In 1994, as the Clinton Administration in the U.S. made an impressive lead in coordinating the country's national information infrastructure (NII) effort and began the global information infrastructure (GII) activities on a governmental and macro levels, as an information professional, I devoted the entire *NIT '94* to this goal by bringing together a small invited group of leaders of our field -- representing different countries, both developing and developed, different sectors of our society, and different governmental and nongovernmental organizations -- for an intensive soul-searching meeting in Alexandria, VA. To have a reality check on where we are in the global scene, *NIT '94* addressed the baseline and fundamental questions related to topics of the NII and GII, such as the definition; objectives and goals, problems, issues, and concerns related; etc. Several participants of *NIT '94* are here at this meeting as well, and you will hear references made to this most productive meeting of the minds.

As a result, the *Alexandria Declaration of Principles* is (1995) available for wide distribution (Appendix 1), a 548-page book entitled *Planning Global Information Infrastructure* was published (Chen, 1995a), and a special issue of *Microcomputers for Information Management* which includes *Alexandria Declaration of Principles* and many major NII and GII documents are included. These publications provide invaluable source materials essential for the planning and development of GII. ---

- Taking advantage of the IFLA meeting, a GDL Initiative Meeting among national librarians of over 15 countries were called at the Tsinghua University in Beijing on August 25, 1996. This is a start of another initiative for more informal dialog and interactive among global library leaders and policy makes. Discussion groups over Internet will be organized soon.

#### • Publication Channels for Information Sharing and Distribution

- *Microcomputers for Information Management* has had a subtitle, "*Global Internetworking for Libraries*" since January 1995. This offers more coverage on some of the baseline problems and issues related to digital libraries and GII, including the promises of digital libraries, barriers and major challenges.
- Books and conference *Proceedings*.

#### • The GDL Prototype on the WWW

Riding on the knowledge and experience gained from the award winning multimedia product, *The First Emperor of China* (Chen, 1993, November), a prototype digital project on the global national libraries have been initiated in late

1993, with basic introductory source materials -- both text and images -- provided by over 30 national libraries around the world. In preparation for the growing use of Internet and WWW, two photo CDs with about 100 images of these national libraries on each CD were created, and a full-text CD with basic descriptive information on these libraries together with some selective images have also been created by using Knowledge Access International's Omni Search Publisher software. The products become invaluable resource materials which are ready for more ambitious WWW application development (Chen, 1995b).

More discussion on the system is described in the following as well as a recent article with an extensive graphic directory of many homepages of national libraries around the world linked together in the GDL Prototype (Chen, 1996).

#### 4. A SEAMLESS GLOBAL DIGITAL LIBRARY PROTOTYPE EXPERIMENT

"The Internet as a context for deploying digital library systems offers an unprecedented opportunity -- not only technically by providing connectivity to an enormous potential user base, but also culturally, given the Internet community's models and traditions of technology diffusion through the distribution of publicly available prototype software -- to move ahead large-scale experiments" (Lynch & Garcia-Molina, 1996, p. 88). The report also defines the digital libraries as "systems providing a community of users with coherent access to a large, organized repository of information and knowledge" (p. 91).

In line with this definition, and in conjunction with the GDL initiative as described, since 1994 I have moved ahead with an experiment -- creating a seamless GDL prototype, starting with the world's national libraries, some major academic and research libraries, national museums, and national archives. These institutions of every country historically have been the archival repositories of the treasures and recorded memories of each country for generations. Each has provided information and cultural backbone to the citizens of that country and around the world. As traditional collections of these institutions are digitized and transformed to electronic files, their knowledge contents can then be integrated and remolded to different information products in multimedia electronic formats to meet the new global learning and information needs.

The current GDL prototype links the homepages of the following types of institutions together in one single global digital library system with a coherent and consistent interface:

- National Libraries
- National Archives
- Selective Museums of the World
- Selective International Organizations
- Selective Library and Information Networks
- Selective Local Digital Libraries

By linking them together in the GDL system, the user community can easily access any site by a simple click of the mouse, without having to search and open the site with the URL address of each location.

Figure 1 shows the homepage of GDL prototype, from where one can have access to information resources of national libraries of those countries included. If USA is selected, then immediately on the left side of the lower screen shows the image icons of the three national libraries of the U.S.A. - Library of Congress, National Library of Medicine, and National Agriculture Library.

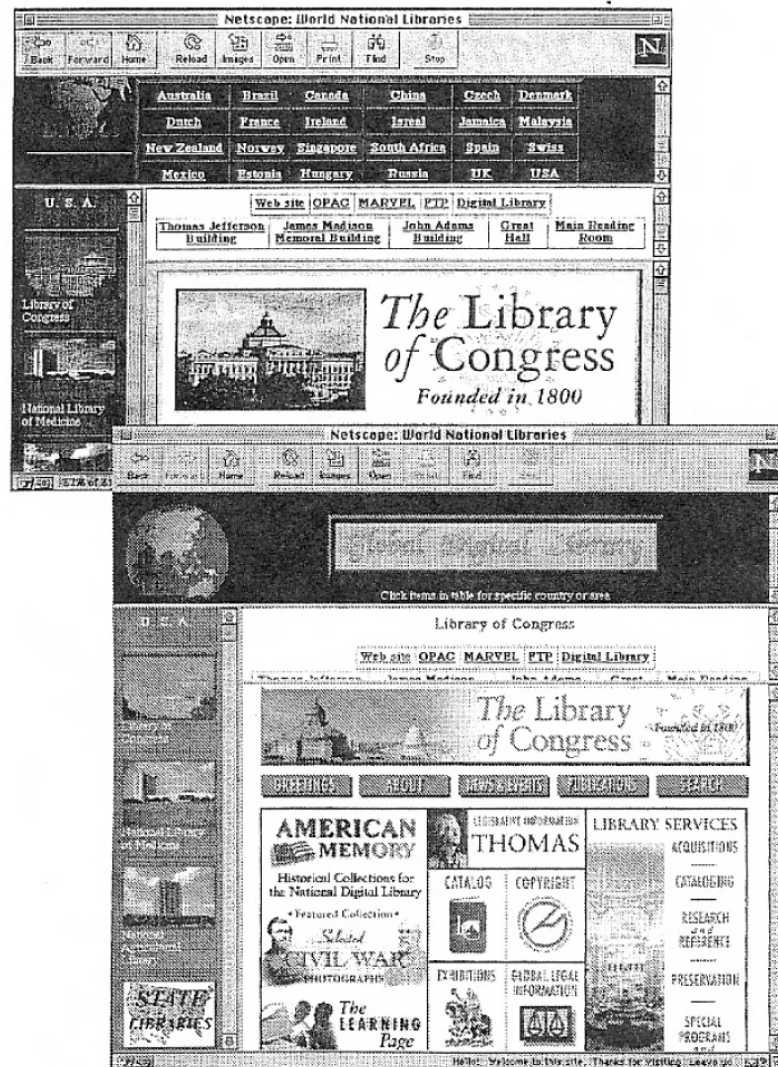


Figure 1. Accessing Library of Congress's American Memory via GDL

Then, if one click on the image icon of Library of Congress, users are immediately welcome to the Library with its picture, and on top of the lower right window, users can choose to either visit the web site of Library of Congress, or use its OPAC or Marvel, or to FTP a known file from the Library, or to use the resources of LC's Digital Library by clicking on the appropriate button. One of the major digital resources of LC is its American Memory. When accessing this, if one thinks of the World Memory, one can immediately go to retrieve that within the same system with the same interface, as shown in Figure 2. Similarly, one can easily access the "memory" of any country he/she chooses provided it is available in digital form. Readers can consult the graphic directory in Chen (1996) for more information.



Figure 2: Accessing the Homepage of World Memory via GDL

## 5 THE NEED FOR INFRASTRUCTURE, KNOWLEDGE-BASED CONTENTS, AND GLOBAL COALITION

The contemporary roles of these libraries have to go far beyond those of the store houses. My project demonstrates that each library can be a dynamic and aggressive information provider of both its country's enormously rich information resources, as well as an effective node of global information network which can provide access to all needed global information. Each contributes effectively toward the eventual realization of "The Global Library", in which national and research libraries in the world can be linked together as nodes of the worldwide information network.

Clearly, the GDL prototype system has demonstrated that provision of universal information access to a large number of world's digital libraries is technologically feasible. But, there are still many hurdles which we must jump over in order to have a real interoperable and functional GDL. These barriers, already discussed earlier, include standards, intellectual properties, copyright language barriers, security, funding, etc... and should not be ignored since they are central issues for any international cooperation.

The experience of this GDL prototype development thus far suggest the need for infrastructure development. It is also essential to form global coalition of major libraries and information organizations so that proper, substantive and higher-level cooperation on the development of the GDL is possible. With this coalition, libraries will be able to find ways collectively to address the following:

- How to make our information resources available in digital form so that they will be available for sharing digitally?
- What kind of funding is available for this essential work? How global coalition effort can help to maximize the limited resources?
- Which portion of our information resources can be shared without copyright restriction?
- If copyright applies, how do we find ways to share the digital information resources?
- How to enable the user community to find the quality digital library resources?

While it is certain that we will have the powerful information superhighway, we are far from having our valuable information resources available in digital form so that they can be linked together by utilizing the available technologies. Being available in digital format will be the first requirement. Unless information resources are available in digital format, there will be no digital libraries. Once the information sources are available in digital form, they can be accessed, distributed, and transmitted easily to end-users over the global information network, such as Internet.

Furthermore, the central concern to the endusers will have to be the authority and quality of content in digital libraries. Take the national libraries for example, the GDL prototype experiment has revealed vividly that although there are substantial numbers of national libraries which have homepages available, most do not have knowledge-based contents. Instead, they are mainly directional and informational in nature. While these are important, they are only "pointers", which has to be linked further to the information itself, so that people can begin to learn and to engage further. Thus, there is a desperate need for quality content building.

Currently we have used the words *cruising* and *surfing* to describe our behavior on the Web, few have invoked the words *learning* or *engaging* when we browse or use the Web, as pointed out by Nicholas Negroponte (1996). How can we possibly learn and engage when the type of information needed is not available (only in printed format and not "being digital") or the type of digital information available is not of high quality or not knowledge-based?

## 5. CONCLUSION

In the current networked environment, the knowledge world is going from a paper culture to an electronic one, and libraries will be deeply affected. In other words, printed information sources, such as books, journals, and archival materials, will not be enough. Digital information sources become essential. That's why more and more libraries are starting to create limitless digital bookshelves.

As we move further in this digital visual information age, the need for each country to develop its national and global information infrastructure and to digitize their information resources will increase sharply. In working toward this global information access, the principles outlined in the Alexandria Declaration of Principles will continue to serve as an effective checklist for successful development.

In spite of the potential difficulties, barriers, and challenges already mentioned here and elsewhere, one thing is certain that the technologies and the infrastructure are in place now for us to experiment on a universal library.

The Web is a digital landmark, as important as the net itself (Negrosponte, 1996). The Web can create a new and more accessible subworld, like a window-shopping or market square experience. But, the Internet is now like a city - people can go places, and can visit communities, as Steve Case alluded to in referring AOL as a bigger "city" than San Francisco or Madrid. The Internet can bring the digital library to not just the local but the global community, and can enable everyone of that virtual community to interactive and engage him/herself in the process of sharing and creating new knowledge based on the information obtained. But now, when he/she arrives at a place and try to make things happen, the experience has been one of frustration and bewilderment.

Being at these crossroads, in addition to speculation on the libraries in the next millennium, we must make sure that we can develop in this seemingly exciting networked environment, a vision for our global library's future, and define its role in facing a new frontier. It is important for us to visualize that not only all types of libraries in our country would be connected to the super-network, but globally all libraries would be part of the network as well. In anticipating the growing demand to use the Net and the Web for more suitable purposes: communicating, learning, experiencing, the GDL prototype has been created to provide users with a window-shopping experience on the world's rich information resources. But thus far, going beyond the window dressing, there no been few deliverable "products" or "contents." We must have the real thing so that the library Net and Web users will not end up frustrated! This is a real challenge!

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