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**Digital Libraries and Virtual Libraries: Definitions,  
Concepts and Goals<sup>1</sup>**



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## Introduction

The wide spread use of information communication technologies (ICTs) in the world today has resulted in huge amounts of information being generated, stored and distributed in digital formats. With the accelerated development and use of the Internet and Web-based technologies in organisations and in homes by individuals, publishing and distribution of information resources in digital format has also become more wide spread. It is now possible for individuals in their homes to have access to full-text journal articles, conference papers, research reports, technical documents, statistical information, data sets, and much more.

More and more people are now using the Internet as a major source of information. In fact, the Internet has been referred to as "*a vast library, containing every type of information known to humans*" (Wallace 1999). Unfortunately, this vast library has developed without any proper organisation of its information resources. Unlike in a traditional library where information resources to be added to the collection are carefully selected, organised - classified, catalogued, and indexed by human beings and catalogues or indexes are generated to facilitate easy retrieval and location of information resources, this has not been the case with most of the digital collections found on the Internet. As indicated by Harter (1997):

*The Internet is anarchic and individualistic. It is not a collection of information resources selected on the basis of their quality, organized by subject, etc. The vast majority of objects on the Internet have no surrogates -- or metadata -- associated with them. Fine-grained searching -- searching limited to specific fields such as subject, editor, year of publication, version number, language, author, etc., is not possible. In general only the objects themselves are searchable, in a full-text, free-text mode that is presently extremely crude and inexact* (Harter 1997).

However, the importance of the Internet as a source of information for most people in the world today cannot be ignored. In addition, the Internet infrastructure can also be used to deliver quality information services to information end-users. Therefore, organisation of digital information resources on the Internet has become a pre-occupation of many individuals and organisations. The result is the creation of organised digital collections of information resources referred to as *digital libraries* or *virtual libraries*.

From the early days, digital libraries have attracted a lot of interest, and this is supported by Harter when he wrote that:

*... there is much interest today in digital libraries. We see many research and development projects, a plethora of international conferences, high activity in the computer science, human/computer interaction, library and information science and other research and development communities, and a great deal of development activity on the Internet. An advanced Alta Vista search conducted in early July, 1996 on "digital library" OR "digital libraries" retrieved about 20,000 entries. Six months*

later, the same search retrieved 30,000 hits, a significant proportion of which were relevant to the subject. (Harter 1997).

### **What Is in the Name?**

Digital libraries are still developing and taking shape, and therefore, there are many definitions of a digital library. In addition, due to a number of factors, among them the large number of players involved in the development and implementation of digital libraries, it has become quite difficult to have a generally accepted definition of a digital library. Most definitions are largely influenced by the perceptions or points of views of the people or organisations involved in digital library projects. It is a matter of different communities, different agendas. For example, an Internet user, a librarian, a computer scientist, a publisher, or a Webmaster will each have a different perception of what a digital library is from their point of view. The search for a general acceptable definition for a digital library is also slightly complicated by the fact that three different terms - "*digital library*," "*electronic library*" and "*virtual library*" - with almost different meanings are used synonymously to refer to the same thing (Saunders (1999)). As a result of this situation, there are many different definitions of a digital library. The best way to conceptualise a digital library is to examine its characteristics or features, and these can be deciphered from the various definitions of a digital library.

### **Digital Libraries**

According to Harter (1997), the relatively recent use of the term "digital library" can be traced to the Digital Libraries Initiative funded by the National Science Foundation, the Advanced Research Projects Agency, and the National Aeronautics and Space Administration in the United States, in 1994. Since then, the term has been adopted by various authors and organisations and various definitions have been proposed. Among the definitions are those by Oppenheim and Smithson (1999), the Digital Library Federation of the United States and IBM (1994), have provided different definitions of a digital library. Oppenheim and Smithson (1999:97) define the digital library as: -

*"an information service in which all the information resources are available in computer-processable form and the functions of acquisition, storage, retrieval, access and display are carried out through the use of digital technologies"*

The Digital Library Federation provides a more comprehensive definition. It defines digital libraries as: -

*“Organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities” (Walters 1998).*

IBM (1994) definition is more of a hybrid digital library, one that includes the features of traditional libraries. IBM defines a digital library as: -

*“a machine readable representation of materials which might be found in a university library together with organizing information intended to help users find specific information. A digital library service is an assemblage of digital computing, storage, and communications machinery together with the software needed to reproduce, emulate, and extend the services provided by conventional libraries based on paper and other material means of collecting, storing, cataloging, finding, and disseminating information. A full service digital library must accomplish all essential services of traditional libraries and also exploit digital storage, searching, and communication”.*

From the above three definitions, and the vast amount of literature available on digital libraries, one can get an indication of the features of digital libraries. These are the following:

- Digital libraries are *organisations* with specific objectives or goals. Most digital library project's objective is to generate, collect, store, and organize information in digital forms, and make it available to defined groups of users for searching, retrieval, and processing via communication networks
- Digital libraries *have functions and processes* being undertaken in order to achieve the objectives and goals of the organization. These include selecting resources to be included in the collection; offering access to resources; distributing the resources, etc. These functions and processes are carried out by a combination of *human resources* and *technological resources*.
- Digital libraries are made up *digital collections*. Digital libraries store materials in electronic format. These include document surrogates like bibliographic records (metadata) and indexes in addition to full-text documents, audio files, videos, and images some of which cannot be represented or distributed in printed formats. These digital works include both *internal* and *external* resources.

- Digital libraries serve a *defined community or set of communities*. Digital libraries are set-up to serve users, and the information needs of the target community or set of communities determine the information content and services of the digital library.
- Digital libraries are accessed by users through a *single user-friendly interface*. The main purpose of the user interface is to perform as an 'access and integration layer' to a managed environment of quality assured information sources in local and distributed environments which are available from many sources (Thomas 2000). In most digital libraries, the interface is a portal accessed using a Web browser.

### **Virtual Libraries**

The term virtual library is simply defined as "...an organised set of links to items on the network..." (Charles Stuart University, n.d.). The term came about as the result of various efforts to organise information resources accessed on the World Wide Web. As the information content on the Web grew, more and more users were faced with the following two major problems:

- How find information on the Internet; and
- How to be sure that the information accessed was of good quality (e.g. authoritative source).

To assist Web users in locating good quality information on the Web, librarians and other interested individuals, started scanning the Web, evaluating and selecting information resources and creating lists or indexes of the evaluated information resources. Therefore, the goal of virtual libraries is to save the time and effort of the end-users searching for information on the Web and to provide access to the information that has been examined for content and reliability. Virtual libraries exist in cyberspace only, they have no buildings or shelves, all information materials are in digital format and are accessible via the Internet.

### **Electronic Information Networks**

In the context of information networks, networking refers to both informal and formal interactions between individuals and organisations, and information networks are formal groupings of individuals and/or organisations with the major objective of common exploitation, management and utilisation of information resources and related facilities/resources such as human resources (expertise) and information communication technology resources (Chisenga 2001). Before the advent of modern information communication technologies, especially the Internet and the Web, organisations developed information resources that could only be used locally. Now ICT, through electronic networks, has made it possible for sharing information resources across the globe.

Libraries are among the major beneficiaries of electronic information networks. They are taking advantage of modern ICTs to share information resources. They are establishing electronic information communication networks in which they pool their resources together for the benefit of their clients. For example, in South Africa, academic libraries have formed consortia in which they use electronic networks to share access to library systems, electronic document delivery and development of common online public access catalogues (OPACs).

### **Infrastructure Requirements for Digital Libraries**

The following are some of the human, financial and technological infrastructure issues that should be taken into account when considering implementing a digital library:

- Availability of appropriate information and communication infrastructure on which the digital library will be built. Basically this will include appropriate hardware, software, and adequate network connectivity.
- Availability of human resources with appropriate skills. Skills requirements largely depend on the nature and sophistication of the digital library being implemented and may include: hardware specialists, network administrators, database administrators, programmers, content developers, information managers (librarians), etc.
- The target community of users should have access to the necessary hardware, software, and network connectivity. In addition, users should have appropriate information skills relevant to the digital environment. They should be able to access and manipulate information in various digital formats – text, video, audio, and databases.
- Availability of financial resources to support and sustain the development of the digital library. Hardware, software, and manpower cost money, and so is the maintenance of the technological infrastructure, licensing of access to external resources, payment for copyrights, etc.
- Availability of appropriate legal and technical safeguards to guarantee authenticity and integrity of information and to protect privacy, and abuse of intellectual property rights and copyright, where appropriate. In fact, digital libraries raise more difficult and complex copyright issues than traditional libraries.
- Availability of standards for the management of digital information resources. For good quality information resources, databases and effectiveness of information searching and retrieval, electronic information management standards should be employed. Standards such as metadata standard, object data construction standard, data navigation standard are required.

## Benefits of Digital Libraries

The major advantages of digital libraries over traditional (paper-based) libraries include: faster addition to the data collection with better quality control, improved search functionality and faster access to information found, but also more freedom and reduced bureaucracy for individual users (IBM 1994). In addition to these, there are other potential benefits of digital libraries. These include the following:

- A digital library is available wherever there is a personal computer connected to the network. Therefore it can be accessed at work places and in the home.
- Digital libraries' information resources are available for access to users around the clock
- In a digital library environment, It is possible and easier to provide access to information resources in other formats that are not possible in the print format environment, i.e. multimedia formats like video and audio

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