Digital Academic Libraries: an important tool in engineering education

Sophia Grigoriadou, Athanasia Kipourou, Erikos Mouratidis & Mirofora Theodoridou

Technological Education Institute of Serres
Serres, Greece

ABSTRACT: This paper focuses upon the role that Digital Academic Libraries play on the education of engineers. In modern society, information diffusion and remote education increases rapidly and consequently, a Digital Library is not just a novelty but also a necessity, associated with the promotion and diffusion of research work that is being carried out within an Academic Institution. Nowadays, a worldwide effort is being made in order to incorporate new technology into education, so as to render it accessible and available to all citizens. In Greece, the first "Digital Library" programs are already operating on a pilot basis and new relevant services are continually being developed; this will hopefully contribute not only to the enhancement of the education of the students of engineering but also to the development of the whole educational and research community.

INTRODUCTION

Academic Libraries and other "traditionally organized" libraries are undergoing a phase of rapid evolution. The Academic Libraries have always comprised a "mechanism" of managing and supporting access to documentation, information and knowledge. It is such an integral, functional part of the University, that one could not imagine a University, without a library [1]. By the end of the 19th century, since the appearance of the first libraries in European Academic Institutions, till today, the main role of Academic Libraries and at the same time the basic reason of their existence, has been to support the educational and research work carried out, within an Academic Institution. Due to the fact that Academic Libraries have always been members of a community that has always targeted on scientific progress, research promotion and innovation, they have always witnessed scientific and technological evolutions, both as recipients of the evolution of knowledge with the acquisition of scientific material as well as institutions implementing all those innovations contributing to the improvement of their organization, and of their ability to better serve their users. For these reasons they have been initiators in the configuration of the emerging new form of libraries, the Digital Libraries [2]. The main intention of the library, being to meet the need for information remains unalterable, though this intention now has to be couched in a new way and to take shape through new services. Libraries then, should undergo a radical transformation. They should not only, be limited to fulfilling the expressed needs of the users, but they should also create the conditions for fulfilling the needs that haven't been expressed yet [3].

The broad introduction and use of new information technology, the rapidly ongoing use of telematics, as well as its most significant results and namely, the creation of the Internet, radically alter a broad spectrum of social activities, creating, with unprecedented speed, a parallel, digital environment for these activities to be practiced [1].

Defining Digital Library is difficult due to the confusion with regard to the term. This confusion, according to Gary Cleveland [4] could be attributed to the following reasons:

Firstly, within the librarian community various terms have been used to describe this new form of library: "electronic library", "virtual library", "library without walls", without ever clarifying the meaning of these terms. The term "Digital Library" simply appears to be the most recent and the most widespread.

Another factor causing confusion is that Digital Libraries are the object of interest of several research areas; as a result a different meaning to the same term may be attributed, each time, depending upon the specific scientific research area it is approached by. For example:

• From the information retrieval's point of view, Digital Libraries are large databases.

• For the ones working on hypertext technology, Digital Libraries are a specific application.

• For others, working on information spread through Wide Area Networks (WANs), Digital Libraries constitute a Web application.

• For large organizations and companies, their document administration systems are regarded as Digital Libraries.

• For a publisher, the on-line publication of a catalogue can be regarded as Digital Library.

• Finally, for the librarians, Digital Libraries constitute one further step to the continuous automation of libraries that started about 25 years ago [4].

The collection of a Digital Library consists of: magazines, educational packages, links with Internet websites, digital books, bibliographic databases, magazine articles, doctoral theses, studies, presentations, announcements and proceedings of congresses, videotaped events e.g. congresses or tours, movies, musical pieces, maps, encyclopaedias, travel guides,

statistics, newspaper articles, multimedia applications, software etc.

So far, the experience gained from operation of digital libraries, shows that Digital Libraries share the same targets and functions with conventional libraries, namely, the gathering, administration, retention, subject analysis, indexing, supply of access and reference work. The changes brought about by the transition to Digital Libraries could be many and varying, but the basic principles of library operation haven't changed:

• Libraries continue using new technology in order to offer access to the biggest possible number of remote (digital) information sources, but at the same time they also continue to select and organize their material – of any kind – aiming to create a qualitative and reliable collection, adapted to the needs of their users.

• Libraries continue to support the ability for their users to freely access information (local and/or remote) from any place outside the library, but users continue to require help from the librarians in manipulating the new research and inquiry tools, and academic institutions keep on depending more and more on them for bibliographic support, configuring new teaching methods, offering remote study programs and life-long education [2].

Hence, the difference in services between a Digital Library and a conventional one is that the functions of the former rely on Internet's World Wide Web, whilst the functions of the latter are limited within the area it is placed. In the time of information diffusion and of remote education, the function of the Digital Library is not only a novelty but a necessity as well, associating itself with the promotion and diffusion of the research work carried out within the University [8].

ADVANTAGES OF DIGITAL ACADEMIC LIBRARIES

• Ability to utilize the potential of digital information and to support contact with their users, even if great distances separate them. For example, each one of us can access an ordinary library in New York or in Hong Kong, expecting to find the desirable information as fast as in a conventional library. This possibility can be realized only through digital libraries' systems.

• Support of many key-words and key-phrases by digital catalogues, and ability of the users to create interpellations, resulting in easier and more flexible information retrieval.

• Response to new users' demands for centralized services and additional services for support, training and guidance.

• Ability to access selective sources of information and online research.

• Easier information retrieval and direct information acquisition with the capability of remote access through its supply in electronic form and its distribution through the Internet.

• Creation of "coursepacks": a form of educational material adapted to the special needs and demands of the course and the student.

ACADEMIC DIGITAL LIBRARIES AS AN EDUCATIONAL TOOL FOR ENGINEERS IN GREECE

Greek Academic Libraries are already at the stage of "Automated Libraries" and the first "Digital Library" programs are already experimentally implemented to many of them. Here too, Academic Libraries are indeed at the ''heart'' of advances. They are called to swiftly switch over to the new form of libraries, ''Digital Libraries'', in order to respond to the incessantly increasing needs for information and not to divert from their main reason of existence, the latter being to support education and research.

Below are the services that have been developed in the attempt of Greek Academic Libraries to respond to current advances:

• Hellenic Academic Libraries Link (Heal Link): In 1999 the Hellenic Academic Libraries Network launched, functioning as a consortium. It consists of the 32 Hellenic Institutes of Higher Education (18 Universities and 14 Technological Education Institutes), the Academy of Athens and the Hellenic National Library. Later, the 18 research centres of National Secretariat of Research and Technology, the University of Cyprus, the Pedagogical Institute, the Computing Technology Institute and the National Rural Research Institute were all added to the consortium. Its main mission is to upgrade, retain and improve bibliographic research and educational sources for the Higher Education Institutes of Greece and to increase the access capabilities for worldwide information.

The members of the Network are able to access distant electronic information sources and services, including electronic scientific magazines.

Heal Link is a member of the International Coalition of Libraries Consortia, an international organization to promote collaborative efforts among libraries internationally [9].

• Union Catalogue of Academic Libraries: its pilot implementation has already started in some libraries and it is estimated that it will be completed by 2006. Upon its completion, it will become the basis of a National Libraries' Network, enabling fast search and retrieval of printed and electronic material in joined libraries, giving them the ability to interlibrary loan at the same time while contributing to the interconnection of Hellenic Academic Libraries with the corresponding ones abroad.

• Grey bibliography: by this term we are referring to the entirety of unpublished bibliography, which includes postgraduate and doctoral theses, lecture notes, internal (technical) reports, intended for delivery research work etc. In the year 2000, the "Artemis" system was implemented. This system is an integrated, distributed unit of electronic documentation, which includes the whole "grey bibliography" from Universities' and T.E.I.s' Libraries. The purpose of "Artemis" is the systematic record keeping and spread of the intellectual production of Universities and T.E.I.s in the country, with the assistance of technology and of digital libraries [10].

• Union Catalogue of Journals in Hellenic Scientific and Technological Libraries: in February 1994 (there was no network in Greece at that time), an initiative of the National Documentation Centre, the National Network of Scientific & Technological Libraries was launched with a view to ordering articles of scientific journals and the interlibrary loan online, among Libraries in Greece. This was accomplished with the development of an online database of the "Union Catalogue of Journals in Hellenic scientific and Technological Libraries".

The National Documentation Centre has been functioning since 1980 and it is the national organization for documentation, information and support on issues of research, science and technology [7].

• National Archive of Doctoral Theses: The collection "National Archive of Doctoral Theses" contains about 13.500 copies of theses, out of which 11.500 are doctoral theses elaborated in Greek Universities, while another 2.000 are doctoral theses of Greek scientists which were elaborated in Universities abroad. The National Documentation Centre implemented this service. Their digitisation started in July 1998 and was concluded in 1999 [7].

SERVICES OF ACADEMIC DIGITAL LIBRARY CONTRIBUTING TO THE SUPPORT OF ENGINEERS' EDUCATION BUT NOT ONLY THAT

The above-mentioned services support not only education for engineers but for the entire educational and research community in Greece.

The education of engineers constitutes an ideal field for the services offered by an Academic Digital Library, due to rapid evolution and the complexity of the required knowledge.

Undergraduate as well as life-long education -through "Digital Libraries"– for engineers in Greece, is supported systematically only by the so called "Data bank'' of the Technical Chamber of Greece. It's about the largest on-line information supplier in Greece concerning competitions (contracting, studies, surveyances) subsidized and research programs in Greece and the European Union, analytical invoices and net prices, Stock Exchange Market and others. It also includes a service called "Law", which contains the entire Greek legislation system and the case-law of the State of Greece as well as that of European countries from 1994 onwards.

The Technical Chamber of Greece is the technical consultant of the State, and the official licensure supplier for all engineers interested in working in Greece [11].

The necessity to create Digital Libraries in Greece is obvious, since it will enable scattered pieces of digital information for engineers to be joined together, forming tools to support their life-long education. The main services offered by these libraries should be:

1. The distribution of digital or digitised collections of "grey" bibliography (as it has already been mentioned, by this term we are referring to all unpublished bibliography consisting of postgraduate and doctoral theses, lecture notes, internal (technical) reports, due for delivery research work etc).

2. Information filtering and suggestion of information sources, so that users are guided to the information of their interest in the easiest and fastest possible way.

3. Active participation in shaping information literacy. By the term "information literacy", we are referring to the ability to recognize the need of locating, evaluating and efficiently using information [5].

4. Participation in shaping study programs, by efficiently supporting the content and the teaching methods for courses (e.g. locating material and sources of information) [6].

5. Distribution of educational material in electronic form.

6. Separate and independent access to data, by developing advanced systems for seeking and exploring the area of digital information (expert systems), thus facilitating self-instruction, remote education and information search in cyberspace.

7. Development of methods to authenticate users' I.D. (recognition of their I.P. address, use of access code and others) in order to ensure their access to the desired information sources.

8. The creation of a user interface environment between the library and its users as well as between the library and the information sources. More specifically, in the case of a Digital Library, the user-library interface environment is its website.

9. The implementation of digital systems to answer Frequently Asked users' Questions (FAQ) aiming to resolve the problems which users encounter during information retrieval.

10. The development of portals and subject gateways aiming to cover the needs for on-time and valid information through the supply of high quality information and the link of new technology with educational process (subject gateways –in the same way as with portals- constitute an entrance point to the Internet. Their difference lies in the fact that while portals supply unedited information, subject gateways simply notify as to where one can locate the information. Thus, information is eventually retrieved after seeking at the website suggested by the subject gateway) [12].

CONCLUDING REMARKS

In the world of Digital Libraries, education for engineers changes its identity. It no longer involves merely learning the use of various retrieval tools, but mainly developing critical thought and the ability to evaluate the information sources themselves, aiming at creating real researchers rather than operators.

Digital Academic Libraries with the development of digital and remote teaching satisfy the engineers' demand for remote, continuous and even life-long education.

By guiding the engineers to evaluate the various sources of digital information, we provide them with the ability of easier and faster access to the material they are looking for.

The Library should constantly collaborate with the Institute, so as to readily respond to any new challenges should they arise and to comply with any new planning.

The achievements of the above objectives will bring about a change in the role of libraries. So libraries will eventually manage to become not only collectors of the information but its navigators as well and will constitute the heart of documentation and information. Consequently, far from vanishing in the future they will continue operating as they used to in the past, only now there will be an obvious difference: the existence of digital services as a dynamic extension; which will result in libraries with a more significant role in society.

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