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Digital Libraries: main trends and issues

Summary

Numerous professional and scientific meetings related to Library and Information Science are held throughout the world covering different scientific, professional and practical issues, among which Digital Libraries certainly fit the bill as a major issue for the field.
Starting with the issue of What a digital library is? one can clearly see from the disposable professional literature that conceptions differ as well as approaches to the problems, ways of organizing or accessing them. Quite a number of professional communities are actively dealing with digital libraries, each from its own perspective. We intend to discuss their approaches as well as results they gained until now.
The products of research related to DL resulted in a growing body of knowledge about digital libraries, not to mention a growing body of literature. An ever-larger number of people and institutions are joining the digital library community. But Digital Libraries are still at the beginning stage of their evolution, and thus present many challenges and opportunities to many professional communities and ask for better cooperation between them.
The intention of the paper is to give an overview of the issues, problems, possibilities as well as of results which can already be evaluated.

Introduction

It is obvious that in today's environment, most library users have access to a vast array of online resources via the Internet. But, it is also obvious that people in general use networked services provided not only by libraries, but also by other providers (on both institutional and individual level). Almost everyone who has access to Internet is trying to get through a 'selva selvaggia' of resources and systems.

Thus, today when speaking about Digital Libraries (DL's), my starting point shall be that we are dealing with a new paradigm of producing, collecting, organizing, disseminating and using information. Such a new paradigm is primarily characterized by the necessity of building up appropriate technical infrastructure and organizational pattern as well as by providing desired content, not by a nature of the human need to seek for information and knowledge.

Among professionals involved in processes of providing access to information DLs today certainly fit the bill as a major issue for the field. Scholarly and professional interest in how to maximize the use of networked information and how to build up digital libraries has grown rapidly throughout the 1990s. A variety of funding initiatives specifically addressing different issues related to digital libraries are underway in the North America (mostly in the USA and

Canada), Europe, Australia, even in Asia, Africa and South America. From the early 90's, a number of digital libraries conferences have been organized and digital libraries topics have been discussed at meetings in a variety of disciplines and professional communities. From these years we have also been witnessing appearance of numerous new journals (print and online) and online distribution lists on DLs. Libraries worldwide, not only national and big research libraries, but public and special ones, are undertaking projects in digital imaging and network services.

As C. Borgman (1999) notes DL's research builds upon a long history of related work in information retrieval, databases, user interfaces, networks, information seeking, classification and organization, library automation, publishing, and other areas. It dates back several decades or centuries, depending on what is included for consideration.

The products of research & practice related to DL's results in a growing body of knowledge about them, not to mention a growing body of literature. But DL's are still at the beginning stage of their evolution, and thus present variety of challenges and opportunities to many professional communities and ask for better cooperation between them.

Why the topic took such an overwhelming acceptance in research and professional community? Is this provoked by the fear that World be evolving without books and libraries, thus forcing necessary changes and adaptations? Or is it a result of a view that DLs offer a new frame to exploit intellectual capacity in global environment?

There is no doubt that research and practice are mutually inclusive: everyday practice produce problems and issues that could be solved through research. Researchers would like to get opportunity to see their solutions applicable in practice. Such a partnership could also be noted when it comes to the questions related to the development of IT and/or prove of its advantages and new methods and techniques.

Research in DL's

Starting with the issue of What a digital library is? we can clearly see from the disposable professional literature that conceptions differ as well as approaches to their problems, ways of organizing them or accessing them. Quite a number of professional communities are actively dealing with DL's, each from its own perspective. We intend to discuss their approaches as well as results gained until now.

Despite building upon a foundation of decades of research and practice in related areas, the term "digital library" is relatively new. The availability of research funding under this term has attracted scholars and practitioners from a variety of backgrounds, some of whom have minimal prior knowledge of related areas such as information retrieval, computer networks, cataloging and classification, library automation, archives, or publishing.

One reason for the confusion of terminology is that research and practice in digital libraries are being conducted concurrently at each stage of the continuum from basic research to implementation. Some people are working on fundamental enabling technologies and theoretical problems, others are working on applications, others are studying social aspects of digital libraries in experimental and field contexts, and yet others are deploying the results of earlier research. Their concerns and foci are understandably different.

The variety of concerns within the digital libraries research community reflects the interdisciplinary nature of the topic. Scholars based in computer science are largely concerned with enabling technologies and networks. Scholars based in library and information science are largely concerned with content, organization, user behavior, and publishing. Those based in sociology or economics are more likely to be concerned with social context and economic models, respectively. Scholars based in application areas such as education, geography, health, or arts and humanities may combine any of these areas with expertise in their problem domain. Many, if not most, DL's projects draw upon the expertise and research results of multiple disciplines.

The DL's research is characterized by the presence of complex problems independently of a preferred approach and by the inclusion of many disciplines. It also calls for national and global cooperation, since basic problems are general and worldwide related. Among them are:

- how to create means and ways for dealing with Hunan knowledge records in the new digitized and networked world
- how to evaluate ways in which these records are used
- what to do with the new products such as electronic "book" or e-journal, how to organize, search or preserve them…

Problems are of technical, organizational, managerial, social, behavioral, legal, economic, and other kind of nature, and they could be best looked upon from interdisciplinary perspectives, involving researchers and practitioners from different disciplines, such as computer science/engineering, LIS, cognitive science, social sciences, law, policy, economics, publishing, management and others.

When introducing DL's issues and projects to Croatian research and professional community it is necessary to underline these characteristics and problems, since every attempt to talk about how to approach the topic should start with a question – Are we conscious of these special characteristics of DL's and are we ready to cooperate?

Definitions

First of all, let us look at the definitional level to agree upon elements of definition and *diferentia specifica*. Surely, definitions can serve many purposes, one of which is to provide a focal point for a community. In an attempt to bring closer different research and professional communities definitions of DL's, it should be noted that the first ones to be presented raised from the computer and information science research community, and that throughout the 1990s evolved in scope and content. The earliest definitions (offered by two US initiatives in 1993, and in 1998 - DL I and DL II), particularly influenced those preoccupied with defining the boundaries of DL's research. In 1992 C. Borgman proposed a definition which stated that a National Electronic Library (the term 'electronic' was used instead of today's dominant term 'digital') is:

- a service
- an architecture
- a set of information resources, databases of text, numbers, graphics, sound, video, etc.
- a set of tools and capabilities to locate, retrieve, and utilize the information resources available.

The first users of DLs were found among students, teachers/professors, researchers/scholars, librarians, authors, publishers, information providers, and practitioners. Contributors of information resources included primarily publishers, universities, professional societies, libraries, authors, editors, and compilers. (Borgman, 1992)

In September 1993 the Digital Library Initiative (DLI-1) defined the term only implicitly stating that "Information sources accessed via the Internet are the ingredients of a digital library." (National Science Foundation, 1993)

As discussed in many articles, the goals of DLI-1 were modest by today's standards. Research was focused (and supported) on three areas:

- how to capture data and metadata of all forms (text, images, sound, speech, etc.), categorize and organize them,
- how to advance software and algorithms for browsing, searching, filtering, abstracting, summarizing and combining large volumes of data, imagery, and all kinds of information; and
- how to utilize networked databases distributed around the nation and around the world.

The discussions about the notion and nature of a DL and presentations of research results were organized at number of conferences and workshops. A 1995 workshop that addressed scaling and interoperability issues in digital libraries resulted in several definitions, the most general of which defines a digital library as a system that provides "a community of users with coherent access to a large, organized repository of information and knowledge" (Lynch and Garcia-Molina, 1995). A 1996 workshop brought a definition of the term ‘digital libraries’ which broadened their scope to encompass two complementary ideas – infrastructure and content as well as community of users/providers. The scope of DL’s extended in several directions, reflecting the contributions of scholars from a dozen

disciplines. It moved beyond information retrieval to include the full life cycle of creating, searching, and using information. Rather than simply collecting content on behalf of user communities, it embedded DL's in the activities of those communities, and it encompassed information-related activities of multiple information institutions. (Borgman et al 1996)

Important results from the DLI-2 include far more concern for social, behavioral, and economic aspects of DL's. At that stage, research areas that encompassed a broader range of academic disciplines were identified, and idea of service to user communities become implicit. Research topics were divided into a number of areas such as human-centered research, content and collections-based research, and systems-centered research.

Discussing issues related to practice of DL's M. Lesk (1997), defined a DL simply as "a collection of information which is both digitized and organized", and Bishop and Star (1996) determined that three basic elements are related to DL's as necessary:

- some sense of a collection, with some kind of organization; the content may be partly physical and partly electronic, or entirely electronic
- a collection that is not entirely bibliographic or exclusively a set of pointers to other material - it must contain some "full-form online material" and may be in a variety of formats
- a goal exists to link "audience, group, patron, or community with attributes of the collection", whether in the manner that physical collections are selected for an audience or in the sense of the virtual space that can be created around a community.
- As Borgman (2000) concludes, all these definitions assume or require that content is collected on behalf of a user community. This aspect of the definition frames digital libraries in terms of their users, which also determines the tools and capabilities those users need to manipulate the content. This could be one of important starting point for our discussion related to the planning and developing of DL's in Croatia as well as to our possible cooperation.

Building up DL's

Many digital libraries conferences, such as CoLIS3 (1999) or this one, play important roles in DL's community building. Professional societies also have important roles, especially in information transfer, publishing or providing discussion forums. But, the investments in infrastructure and education are among the most important steps which have to rely on national policy and high-top decision-making level.

Alongside with US projects, stand efforts of G-7 group, EU and some national funded projects which support the development of a global information infrastructure and access to culturally and linguistically diverse content.

The European Union (EU) funds and promotes a wide range of information-related research and development under Directorate–General XIII, Telecommunications, Information Market and Exploitation of Research. Many other countries have established national information infrastructure programs and associated research and development support mechanisms.

As in many other countries in the world, foundations for the revolution in dissemination of information in Croatia were set with the advent of national academic and research communication network - CARNet. From the early 1990's till today, CARNet has been developing not only information infrastructure but also providing or making possible to its members to provide network related content. CARNet users and providers have at their disposal different applications and programs (for the access, processing and organization of information), and can rely on network standards and protocols (for connecting networks, protecting privacy of an individual, security of information, security of networks) as well as on professionals who assist teachers, application and service developers, and users in general. (Vucic, 1998)

One of CARNet's fields of interest is connected with the evolution of DL's in Croatia, as it is obvious from this year's CUC as well as from some pilot projects which
involve and perpetuate cooperation between scientists from different fields.

The authors' opinion is that the Digital libraries are not 'specialty' to any one field or area of research or practice, to any one social institution, or to any one community.

Content of DL's

When deciding about building up DL's and providing their content on the Internet, three critical groups of issues have to be looked upon:

- who is the intended user population,
- what are the unique features of the content that is provided and,
- how to ensure the quality of the content. (Ordeals, 2000)

These issues form the framework for content related work and have to be understood by all of those engaged in planning process of DL's.

Further, deciding about the content that needs to be provided on the Internet one has to understand users' information needs and access capabilities of the intended user population. Together with the building up of infrastructure, these issues could be seen as necessary prerequisites.

The other 'big issue' is the type/s of content that can be presented in DL's, including selection principles and policies. This could range from conversions of historical materials, cultural heritage etc. to kinds of information that have no analogues in the physical world.

There is no doubt among professionals that transferring online public access catalogs (OPACs) to the Internet for wider public use was an early example building up the connections between conventional information formats to digital ones. But, these attempts also provoked discussion about the next stage of development which, alongside with bibliographic data, have to offer full-texts, images, and possibilities of users' interactive roles. At the stage of 'hybrid libraries', a wide range of digital collections stand between the traditional library and the virtual library. A successful hybrid library would offer users seamless access to integrated print, electronic, local and remote resources (Pinfield, 1998).

Currently, pilot projects related to DL's or better to say digital collections are underway in Croatia as well, including digital collections of Croatian cultural heritage, exam literature collection, etc.

One of issues of special interest to all of DL's community is preservation of digital materials. National repositories, which are often major contributors to electronic library networks, may well be in the position to negotiate the rights to acquire electronic content on behalf of a great number of libraries within a country. Therefore, legal deposit may be a formidable tool

for the enhancement and harmonization of practices concerning public access to electronic information (Recommendation n. 12).

On the other hand, in the on line environment, networked national bibliographic services should revive cultural identities by promoting content which cannot be easily commercialized in a global context. They should be able to complement information provided by search engines (Altavista, Yahoo, etc.), whose search structure is English oriented and therefore does not take into account linguistic and cultural differences (UBC Recommendation, 1999).

The first issue in coverage of netdocuments: what types to cover, thus appears to be an insoluble one. So does the second issue, that of territory covered.

How does one define a place of publication for a net document? Is place of publication where the server is physically located? or the domain in the URL of the document? The first can be difficult to ascertain. Therefore, place of publication can be determined by domain-name in URL.

Conclusion

Interest in digital libraries research and practice has expanded rapidly throughout the 1990s. Major funding initiatives in the U.S., European Union, and elsewhere have influenced research and development. Nevertheless, the term "digital library" has still multiple meanings and many definitions are used. These definitions cluster around two main themes. From a research perspective, digital libraries are content collected and organized on behalf of user communities. From a library practice perspective, digital libraries are institutions or organizations that provide information services in digital forms. (Borgman, 1999)

Research areas include topics ranging from ‘high end computing and computation’, ‘large scale networking’, ‘high confidence systems’, to ‘human centered systems’ and ‘education, training, and human resources’.

It could be said that DLs are services which stand to benefit from research on almost all aspects of digital libraries as content, collections, and communities.

Conversely, researchers studying many digital library problems will need partnerships with information institutions (libraries, archives etc) to study and test in operational settings. This is especially related to research on social, behavioral, and economic aspects of digital libraries.

Many fundamental technical problems in digital libraries research remain to be solved. As digital libraries become more sophisticated, more practical, and more embedded in other applications, the challenges of understanding their uses and users become ever more urgent. These are inherently interdisciplinary problems, and will require the contribution of researchers from many backgrounds. Some of them who have yet to hear the term "digital libraries", much less recognize that their interests are relevant. (Borgman, 2000)

However, the electronic resource librarians and digital-savvy staff attending ER&L have a leg up in this arena, using their numbers-driven mindset and access to countless reports to offer best practices to advocate for not just adequate, but abundant funding. In the words of speaker Alice L. Daugherty, Coordinator of Acquisitions & E-Resources at the University of Alabama, librarians are â€œbetter equipped today, now more than ever, to demonstrate the value of libraries [â€¦] we have so much more data that proves what we are buying today is tremendously useful, and thatâ€™s where we can begi...Â One of the foremost tenets of todayâ€™s modern academic library is the enablement of collaboration, exchange and productivity amongst students and researchers. Digital Libraries â€¢ â€˜Digitalâ€™, â€˜Virtualâ€™, â€˜Electronicâ€™ Library as network-based library without regard to place and time. â€¢ Tendency to apply term to digital collections and resources. â€¢ Digital Collections vs. Digital Libraries. â€¢Â Digital Library Tools â€¢ We have at our disposal the tools to create integrated digital libraries from the distributed digital resources environment in which we operate: â€¢ Standard retrieval environment (Web) and interface/client (Web Browser); â€¢ Standard transport mechanisms to connect heterogeneous content (HTTP, OAI, SOAP); â€¢ Standard metalanguages and tools for describing and transforming content and metadata (XML, DTDs & Schemas, XSLT