



Digital Libraries

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Fabrice Papy

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Preface

Are virtual or digital libraries a step forward in the evolution of those “warehouses of books” which, due to their existence, mission and organization, go hand in hand with the creation and progress of knowledge?

Has the tidal wave of IT only a minor, or in other words technical, impact on the complex structure of a library or does it redefine the libraries’ role and mission?

Does the improved access to information based on the Internet and search engines that may be associated with a phenomenon known as “googlemania” overthrow the intellectual and social institution of the ancient world of libraries?

Are digital libraries not the next step towards the future of the information society that moves away from traditional material and looks for new means of storing, preserving, organizing, restoring and, last but not least, visualizing examples of its very own development?

This preface could, without any doubt, fill several pages with simple questions or even sensitive issues on digital libraries. The questions above should therefore only give an insight into the problematic of the impact digital technologies have on the institutions that preserve and organize knowledge.

It is rather difficult to ignore the digital revolution as it is based on the Internet, a very powerful player also widely known as the World Wide Web.

Supporters of the Internet see it as a source for the production and distribution of information as well as a never-ending matrix which offers solutions when improving search techniques and the organization and structuring of data.

However, the network of a digital library based on the democratization of access to electronic resources has rapidly led to changes in people’s attitude towards it.

Doubts about the validity of information have been expressed. Librarians therefore need to develop the skill to retrieve valid data. According to Christian Jacob, the search for digital data delivers a number of works which are interlinked. Their complex connection is based on logical presupposition, genealogy, complementarities and mutual explanations¹.

As opposed to the Internet, a library is not only a collection of books which are subject to change, but it has several different missions. One of them is the conservation of books, i.e. archiving. Libraries also represent a privileged environment for intellectual work and research. Users increase their knowledge and adapt their way of thinking to different concepts, as they first need to familiarize themselves with the way the library functions, i.e. its organization as well as the rules and conditions for the use of the library.

This book on digital libraries focuses on new challenges effecting digitized university libraries, public documentation services and privileged partners in teaching and research at French universities.

In the following chapters librarians, information officers, editors and researchers will help the reader to gain an insight into the human, social, organizational, intellectual, political, scientific and technical dimensions of digital libraries.

Fabrice PAPY, Associate Professor, University of Paris 8,
Gil-François EUVRARD, Head Archivist, University of Paris 8.

¹ C. Jacob, *Rassembler la mémoire. Réflexions sur l'histoire des bibliothèques*, Diogène, no. 196, PUF, October–December, p. 56, 2001.

Chapter 1

The Growth of the Role of Librarians and Information Officers in Digital Libraries

1.1. Changes in the world of documentation

Due to the technological and digital revolution, the role of librarians and information officers has undergone important changes.

The transformation of documentation can be established on two different levels:

– for a long time now documents have been produced in a digital format. For 10 years publishers have been using printers that print electronic files which are transferred onto a photocomposition. The programming languages SGML, and later XML, enabled the production chain to work as a digital information channel as well as being able to print scientific documents. No matter whether documents are created in businesses or scientific and cultural institutions, they are all produced in an electronic format. Paper is no longer the only possible way to publish a text;

– the exponential increase of digital documentation has changed people's perception of digital documents over the past two or three years. Digital documents are no longer an exception, they are becoming increasingly common, not only due to the number of them that is created, but also because they can be accessed easily.

Furthermore, the increasing presence of telecommunications and computers (hardware and software) amongst the general public, and especially within libraries, needs to be taken into account. Without this increased access to virtual

infrastructures the digital document could never have become so important in terms of access to information.

It is impossible to entirely understand the digital revolution without considering the normalization process that is taking place in all possible technical fields. Opposed to traditional, parallel running normalization processes that have been observed in other economic sectors, this type of normalization process is not entirely transversal but is at least similar for related forms of economic activity, i.e. the way documents are structured or researched on the Internet. Editors, distribution channels, libraries and archives generally use the same, or very similar, systems.

Furthermore, the possibility of retrieving documents which previously were only accessible within documentation centers or libraries has undergone a transformation process. These documents are now made available to a larger audience as they can be accessed from anywhere in the world. Libraries and documentation centers are benefiting from this change.

The Internet has imposed itself as the universal tool used for retrieving information that can be presented on a screen. Its ergonomics are simple and there is no link between search functions and the actual content that is being researched. This type of ergonomics is similar to any other classification system. Experts in the field of information and research state that the simplicity of this type of search engine stops the user from finding the required information. These, however, are very rare cases. This type of search engine has certain advantages over traditional classification systems. Libraries now use the same type of search engine for their own catalogs.

This new kind of search engine has led to a great increase in the performance of access speed and different modes of research. Progress in this field has not yet reached its full potential and important developments are still expected. Currently, these search engines allow information to be retrieved in fields which traditional classification systems simply do not cater for. Specialization still lies far off in the future. At the end of the 1970s and in the 1980s specialists were required not only to work Boolean operators, but also to understand the programming language which was specialized for each database. The use of symbols such as BA = for search entries on the Questel database still lies far off in the future, just as is the case for a “common communication language”.

1.1.1. *Transformations in society*

It is not only technology that has changed, but also the general public.

It is clear that we are faced with a different kind of general public which is marked by three main characteristics:

- readers no longer concentrate on one single type of activity. At their workstation they easily move from evaluation tasks to social activities. Work and social activities are highly interlinked. Technological innovations open up these possibilities and the user's behavior is adapting to them;

- the general public likes this type of search as no further requirements are needed. The Internet is used for empirical research as well as for entertainment-based activities;

- this new generation of users is also able to choose not to rely on information systems. This is not an entirely new trend but now technology also supports it. Professionals also have to review their position instead of resisting or ignoring this new trend. The general public actually resolves most questions on their own. However, after working with intuitive search tools the public will become aware of their limits and seek professional support. The reader no longer depends on professionals to retrieve information which could be classed as a revolutionary step forward in the field of research.

Moreover, changes which are introduced by new movements within the field of documentation also have to be taken into account.

1.2. Transformations in the economic situation of libraries

1.2.1. *Too many hits?! The new trend of vague search entries*

Traditionally, librarians and information officers used search engines that retrieved documents which were 100% related to the user's question. The following fundamental problems occur with this type of search engine:

- a full understanding of the user's question is a prerequisite;

- librarians have always found it very difficult to understand exactly what the user was looking for. However, is the idea of completely understanding the user's question not simply an illusion? What if the user simply has difficulties expressing his/her question in a standardized way? A mediator between the user and the system was needed in the 1980s as technological limitations imposed a rather complex language used in the research process. This mediation is no longer needed as the

reader carries out his/her own research by establishing their own search criteria to obtain the required information;

– by finding the exact documents, there is no space left for those hits that might only be partly relevant to the given question.

The information officer's reluctance towards material that is not entirely relevant or the problem of vague research is, however, only happening inside his/her head. How many search engines have been criticized without them even being tested? OLCL was used in the 1980s and was based on two different search keys, author-title 4,4 indicating the first four letters of the author and the title, and 3,2,2,1 which indicated the number of characters of every word in the title. These systems are, of course, old-fashioned but without any doubt highly efficient. They also never produced too many hits. People who are used to online search engines also know how to choose the right key words that will give them the required material in the first three entries on the page.

A system that works very precisely and only delivers results that are 100% relevant to the user's questions requires a professional librarian or information officer. However, general users are therefore unable to use such a system on their own.

Advantages of intuitive search

Since systems are able to limit the number of results, the phenomenon of too many hits within a search process has been regarded as negative for such a long time that its advantages have been forgotten. Intuitive search engines provide the user, who has previously established the boundaries of his/her research, with an overview of all possible data to be found on this topic. The retrieved data includes more information than the user actually needs and not all of it might relate 100% to the given subject. However, all of this data might, to some extent, be relevant to the user's search entry. This is why it provides the user with an overview of all resources that might relate to the subject.

Intuitive searches help to establish the boundaries of the question on their own and indicate ways to ask a certain question.

1.2.2. *The integration of heterogenous services*

The Internet and its easy navigation allows for applications to become more interdisciplinary. The user moves from one application to the next and sometimes also moves towards more entertainment based activities. This is why the OPAC

(Online Public Access Catalogue) needs to be created as some sort of portal that allows access to many different applications.

1.2.3. *The librarian's challenge to reach customer satisfaction*

That a user might be happy with the responses obtained from the search engine is something rather shocking and worrying for librarians.

It is shocking because librarians know that the user of the system has missed out on relevant answers, not only from the system used because he/she lacks experience in research, but also because other systems of documentation that are different from the one used have not been taken into consideration.

This is worrying because the user is satisfied with incomplete information, as the research target was badly set. The user even accepts the risk of missing out on important aspects.

Furthermore, librarians see that the user ignores, or remains indifferent, to the role they play within the library.

There are certain points to be made with regards to this phenomenon:

- the average user looks for one answer, not all possible answers. The librarian's obsession with delivering all possible answers is a surplus in quality that is not appreciated by the user;

- librarians are only ignored when the research to be carried out does not cause any problems or is carried out on data that is not complex. This is only the first step in research. Librarians can therefore concentrate on complex problems where their help is needed and where their intervention makes sense;

- librarians are not completely deprived of the research process, but no longer play the role of the mediator between the user and the system. Librarians fulfill their role when structuring primary data and metadata which is classified by search engines. Their tasks are focused on the more sophisticated levels of the process of documentation.

1.3. Changing a paradigm: changing the object "information"

1.3.1. *Breaking with the traditional way of managing physical objects*

The transition from an analog to a digital environment can be considered as a cultural revolution since the physical aspect of objects is changing.

1.3.1.1. *From a manufactured object to information objects*

Traditionally, libraries consist of manufactured objects such as books, magazines and CDs that are classed as volumes, series or disks. Their content is subject to the support which is used to store the information.

In the digital environment, the document is independent of its support and leaves room for experiments. The interpretation of its content, its structure and its additional metadata gives it its own force in the field of documentation.

1.3.1.2. *From an exogenous catalog to endogenous metadata*

Traditional documents such as paper, tape and disks do not comprise elements of documentation that enable the user to retrieve them. This is why librarians and information officers have invented certain techniques and rules to classify and retrieve these documents. The elements used to classify documents and create an index are, of course, taken from the documents. However, this is done in an artificial way by a librarian who will create data and transmit it to an exogenous catalog.

From the minute digital documents are created, they contain descriptive elements that enable the user to classify and manage them. This metadata is endogenous, i.e. integrated into the document. Furthermore, within the process of documentation additional metadata is integrated into the document. The general trend is moving towards a completely automatic process of administrating data, as the capacities are far too large for any human intervention. The way this data is processed therefore needs to be programmed. Here again, the librarian's expertise is required to process the given data.

1.3.2. *New objects in documentation*

Dematerialized documents that do not require any form of support

The first step in the digital revolution is the dematerialization of a document. This does not only mean that the document can be accessed from any possible location, which introduces the concept of ubiquity, but also that the processing of this document is carried out automatically. It takes a tangible form which allows for the visualization of its form, its reality and its integrity.

Furthermore, as the document does not need to rely on any kind of support, the importance of the layout changes. Its layout is subject to its structure.

Without a stable support, the question of how to materialize the document is not a question of how stable a support is, but only deals with the question of which role the content plays within its environment.

Hybrid objects (multitypes) represent the next generation of objects. They are based on multimedia and can read texts, icons, maps, videos and even 3D images as well as tables and programs. The term multimedia, which was previously used in a different sense, finally measures up to its meaning here. Complex objects are not only created, but are also managed and presented to the user.

These new documents are structured documents. The way the information is structured, based on XML's standards for example, integrates the semantic significance of the document. This enables the user to retrieve information inside the document, i.e. internal navigation.

The adjustable level of granularity in these objects is also a revolutionary trend in the field of documentation. Traditionally, libraries or documentation centers only addressed one level of granularity. These are the number or title of a series, an article in a periodical or the chapter of a book. Traditionally, libraries or documentation centers only processed one level of granularity. A book and a reference, an article in a magazine, and a video as well as an illustration and a manuscript, are now processed simultaneously. This form of processing is based on the use of tree-diagrams.

Direct access to pieces of information is a great advantage of this concept as it is also possible to preserve the visibility of the entire document and therefore keep its coherence.

Understanding all functionalities and transformations in concepts and techniques is vital for librarians if they would like to gain full insight into the transformation of tomorrow's documents on the Internet, which works very differently from the librarian's traditional research techniques.

1.4. Changing a paradigm: information in a network of documentation

1.4.1. Information is linked to a network of information

Digital documents can no longer be a simple back-up of paper documents. They should be navigated with the help of internal links as well as links that are created between different documents. This technique goes further than the reference system used in paper documents. It is a philosophy that includes alternative routes and allows for the personalization of the order in which the information is read depending on reactions of the public (e.g. open lectures) or a previously established set-up.

With the digital document being “active” it can actually process itself. Linguistic structures or statistics, in particular within the semantic environment of the document, could be automatically linked to the document therefore allowing for a better understanding of the document.

1.4.2. Processing a high flux of dematerialized information

The fact that traditional administration systems in libraries are no longer used also stems from the large amount of digital documents that are transmitted to libraries. It is therefore impossible to process every single one of them, even more so since the documents only consist of files and bits.

Automatic processing is therefore required to enter data, process it and manage it. Visitors to a library have to use programs to deal with this enormous amount of information.

Professionals intervene at a higher level. They set the parameters for the automatic manipulation of this information.

This also means that the trend is moving from manually administrating every single document towards an era where sampling is added to manual administration.

Digital processing of documents requires the introduction of identification procedures and troubleshooting (faults, rejection, etc.). These are of a rather industrialized nature.

1.5. A new way of organizing libraries: the impact of the digital revolution

1.5.1. Impact on the functioning of a library

If the traditional aims of a library are to remain the same, research techniques have to undergo profound change due to the developments that are linked to the appearance of digital documents.

The task of acquisition can technically be subdivided into two different forms:

- harvesting and the appropriation of the entire content, or parts of it;
- the acquisition of files requires an at least technical agreement between the supplier and the client.

Processing data will then include the following steps: extracting metadata from the documents received from outside the institution, as well as from documents

produced inside the institution, structuring these documents, and tagging and enriching the metadata.

The storage capacity of these systems is linked to the architecture of the information system used. It is, however, extremely important that librarians are familiar with this system. They therefore need to broaden their knowledge and skills in this field.

The library's task of preserving information cannot be confused with the pure storage of it. The preservation of data, even in the digital era, remains a task that can only be carried out by a library. Documents therefore need to be processed in a way that enables the user to find and exploit them in the future.

The job profile of librarians and information officers therefore adapts itself very well to researching digital data. Research strategies, such as hyperlinks, need to be reviewed by professionals in the field of documentation, including the usage of the most powerful technology that is available today. This new trend needs to be taken into account and the readers need to be supported during this transition period.

1.5.2. Impact on the concept of information

Digital documents work "intelligently" if they are programmed in an intelligent way. This is why the acquisition of know-how is needed in the fields of tags, integrated metadata, weighting system, and how widely the document is known in the scientific community. The concept and the perception of information are changing.

1.5.3. Impact on distribution

The distribution of a digital document on the Internet can no longer be compared to the traditional distribution of paper volumes, even if they were categorized and accessible from several libraries. Its distribution has increased 1,000 times over. This increase can be applied universally. This is why digital documents raise so many questions that could already have been applied to paper documents but were never discussed to such an extent because their distribution remained more limited.

1.5.4. Impact on intellectual property

The question of intellectual property, copyright, quotations, etc. has a negative impact on the researcher and editor's image of electronic documents. Even if these problems increase due to the high speed and universal access to electronic

documents, digitization also allows for those problems to be addressed far more efficiently. If the document is not public its access can be protected. Above all, it is possible to link access authorizations given on one single document to general access authorizations that are valid for the general public. A document can therefore only be accessed by its target audience. Abuse is quickly established by the server. In the case of public documents, it is important that they are used by other people, while at the same time the author needs to be protected from plagiarism. The idea that plagiarism is much easier with documents that can be accessed on the Internet is not a valid one since the intellectual property of a document that is quoted, read and therefore widely known is much easier to protect. Furthermore, it enables the researcher to give a perfect quotation by using the copy/paste function and therefore minimizes the risk of giving a false quotation.

1.6. New trends

1.6.1. Introducing administrative aspects of documentation into the document

Digital documents are far more than just an edited document. They are also objects of documentation, i.e. pieces of information which can be accessed and inside which we can navigate to its metadata. The way in which the document is structured is significant; its tagging and the introduction of administrative metadata must be carried out with great care when the document is created or handled later on.

The document is not an isolated entity. It is part of a network of a series of documents accessible on the Internet which is now transforming into a documentary system. Documents which are published on the Internet are connected through links in the hypertext. In the case of archived material digitization, this often leads to problems in identifying a specific document amongst all others. In some cases a website has to be considered as a tool in the documentation process similar to a collection of articles.

1.6.2. The librarian's role in the editing process

The librarian's know-how is increasingly required in the editing process. In the future, librarians will assist authors, especially in the field of university-based research, in order to help them to produce intelligent documents. They will also work with editors and underline the fact that additional documentation is of great importance to a document, even if it is fiction (e.g. bonus tracks such as documentaries that give added value to a DVD).

Previously, librarians played an important role in the institutionalized diffusion of information. Their role is changing and they will also be involved with, and guarantee the quality of, information distributed on the Internet.

The most important sector requiring librarians in the future is preserving digital documents in the long-term. In this sector the tradition of libraries is needed to develop the necessary know-how, as a library gives priority to cultural aspects over economic interests.

Future job descriptions for librarians and information officers will clearly contain the fact that they represent the link between the library and the publisher.

1.7. The digital library

1.7.1. *The virtual library*

A virtual library is a library where documents are virtual, i.e. without a stable support. There are several advantages to virtual libraries.

First of all, they are dematerialized and their location therefore becomes insignificant. Digital libraries have the advantage of universal access.

Digital documents can also be accessed by several users at a time. Thousands of people can visualize and download a document without hindering others doing the same.

This type of library is far from being homogenous. Its sources, structures and documents are highly diversified, they stem from internal (institutional) production, commercial production, online collections etc.

Their documents are real multimedia documents, i.e. hybrids of different forms of media. These documents need to be organized, and standardized access to them must be provided.

1.7.2. *A “real” library*

A digital library is a real library since its collection is organized, selected and well presented. Its documents are processed and administrated and their access can be controlled. A digital library also responds to the need to develop collections of documents such as digital resources, articles, books, etc.

1.8. Introducing different layers to the core sector of the profession

Rather than believing that the profession of librarians will change, which is only applicable to some cases, the introduction of different layers in the core sector of the profession should be taken into consideration. The core sector of this profession re-invents itself each time a new field of work is discovered.

1.8.1. *Support for online library users*

The librarian's task of advising and offering support to users is also changing within the digital environment. Librarians work in shifts throughout the world to provide a service which is up and running 24 hours a day, seven days a week.

Legal questions regarding the creation and distribution of documents, which were already worrying in the times of traditional libraries, have come a step further in the digital environment as it increases distribution.

1.8.2. *Providing training for users*

If providing training for users is part of a librarian's duties, this task becomes much more diversified with documents developing an internal structure.

Other than knowing how to use traditional resources, users also need to be shown how to use electronic sources. The latter does not replace the use of traditional resources, but completes them.

1.8.3. *Managing materialized objects as well as digital documents*

Managing materialized objects is a principal part of a librarian's work. However, they also need to know how to manage virtual documents of a complex structure and how to work under a certain format. Librarians have to become experts. Limits have to be established that indicate when analog systems are an advantage and when they become a handicap. It is up to the librarians to conquer this new territory.

1.9. Broadening skills and responsibilities for all of the library's staff

1.9.1. Managing old and new techniques simultaneously

As previously illustrated, new technologies do not replace the old ones, they actually complete each other. In libraries the traditional and the new technologies amplify each other.

Librarians need to pay attention and react to new techniques and methods that come up in their field of work. On the other hand, they do not have to forget about their traditional tasks as the documents they are in charge of, as well as their clients, belong both to the old and the new era.

By learning how to use traditional methods and understanding the cultural aspects of a library, librarians will find it easier to use future technology without jeopardizing the library's essence.

1.9.2. Increasing qualifications and responsibilities

The digital environment requires an increase in skills as these new competencies need to be added to the old ones. Furthermore, an increase in quality is needed as a digital working environment requires a higher level of analysis.

In the digital environment the librarian's responsibility in terms of content increases since their choices are made public when the documents are distributed on a large scale.

The digital environment increases the relevance of the institution's strategic and political decisions.

With new technology, these choices become increasingly risky as the position of the institution partly depends on the library's capacity to transform itself into a modern institution.

The legal responsibility of every single librarian, and not only their director, is based on the increasing number of documents produced by the institution that are distributed online. Access to these documents also needs to be protected and access conditions must be created.

During this transition period librarians need pedagogical capacities when creating digital documents, i.e. the technical side of production as well as a profound knowledge in the field of heuristic research in the digital environment.

The digital environment requires a higher level of technical skill not only to carry out editorial tasks or those linked to the organization of a library, but also to make the right strategic choices for the library as an institution.