

# **Challenges in the evolution of scientific and technological libraries: adaptation and synergy for survival and success**

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## **Abstract:**

A brief overview is presented of some challenges that science and technology libraries have to face, caused by the evolution from classical libraries towards more electronic and digital libraries. This is a consequence of the fast evolution in information and communication technology (ICT) that has led to more applications of ICT, not only to manage classical libraries, but also to create, distribute and access information resources in digital format through computer networks.

## **Keywords:**

library management; evolution of libraries; science and technology libraries; hybrid libraries; digital libraries; library portals; user education; information literacy; information and communication technology; ICT; microcomputers; Internet; WWW; websites; hyperlinks; OpenURL

## **Introduction**

This contribution provides a brief, structured overview of the evolution of existing libraries and of some challenges that this brings to librarians. Classical libraries form the starting point: there information is carried in the form of hard copy documents and information and communication technology is hardly used. At the other end of the scale we see purely digital libraries. Most classical libraries have evolved to hybrid libraries, where we see classical hard copy documents and management methods, as well as more contemporary digital documents and databases, and management systems that are based on computers and computer-networks. Users expect further evolution and improvement of these hybrid libraries and of the services provided. This creates many challenges for the librarians.

## **WHY?**

Why do libraries evolve continuously? Why are changes taking place in their functions, activities, roles, and tasks, during recent years?

The recent evolution is mainly determined by the application of ICT in classical library management activities and by the growing importance of online available information.

## **WHAT?**

What are the changes that we observe and that we have to cope with?

More ICT has been applied in classical tasks and activities like collection development, acquisitions, classification, cataloguing, providing an online public access catalogue, lending to local users, interlibrary lending and document delivery, providing reference services, financial management, communication with staff and users...

Furthermore, we welcome a growing body of digital information sources and we have to incorporate these in the library services offered. These sources are mainly distributed on optical disks or online. Therefore, libraries provide access to sources on optical disks on stand-alone microcomputers or through a local area network, and to microcomputers that can access information sources that are provided through the Internet and the WWW.

Users can be overwhelmed by the high number of resources that are made available. Deciding which resource to use is a challenge for many users. Furthermore, once a selection made, the user interface offered by the chosen resource takes time to learn, as most resources bring their own proprietary retrieval system. Therefore librarians try to offer tools to their users to assist them in these actions, in a continuous fight against decentralization, disintegration, and lack of interoperability.

In view of the increasing importance of attacks on computers, with viruses, Trojan horses, spyware...librarians must take care of security in the library's computer environment.

All digital information is not available free of charge. Therefore librarians must apply some computer system for authentication and authorization of users.

Librarians should provide current awareness services through Internet to inform users of new information sources. To save time, such services should be personalized, so that only information is delivered that is likely to be interesting to a particular user.

The information landscape is getting more complicated for users. Therefore librarians should keep on playing the role of guides through this ever changing landscape (see for instance Policy Committee of ACRL's Instruction Section 2003).

Librarians can contribute to the personalization of access to online information sources, as these can be embedded in a more "intelligent" system than the classical library, that is based on computer hard- and software (see for instance Neuhold et al. 2004).

Librarians with a special interest in ICT can perhaps provide assistance to users of digital documents in the local management of these documents on computer, at the level of individual, department or whole organization.

The flow of scientific information from authors through publishers and libraries to users, according to classical methods, is hindered by several problems. Therefore everyone involved in this system, including certainly authors and librarians, should contribute to the transition from this system that can be summarized as "publish

free of charge and pay to read if you have the required money” to some alternative system summarized as “pay to publish and enjoy reading free of charge even if you have no money.” (see for instance Suber 2003, McKierman 2004, Open Archives Forum).

Librarians can contribute to the digitization of documents. Priority goes to documents that are important for the local community, and to local documents that can be important for a wider audience.

Furthermore, all the activities mentioned above should continuously be evaluated, be questioned, be adapted to the ongoing changes in technology, budgets, and priorities, and be improved as far as possible.

## **WHERE?**

Where is the library? Where should the library be?

More information becomes accessible through the Internet and the WWW, independent of place and time. Therefore the classical library as a physical place that is located concretely in a specific area, becomes less important. At least a virtual, digital library component should be added, that is also accessible from everywhere at all times through the Internet and the WWW.

Users should not neglect important information that is stored in classical, non-digital documents. To overcome this growing problem, the library should be more assertive, attractive, user-friendly and easy to use. This can give rise to competition between the classical and the more recent digital library components of the contemporary hybrid library; the money from the available budget can only be spent once.

Electronic mail and mobile telephones are increasingly common and affordable tools for communication. Their implementation can allow better communication among staff members and with users, also more independent of time and place.

The application of computers and Internet allows some librarians to work outside the classical, physical library buildings, from a computer that is connected to the Internet. This can offer advantages in functions such as interlibrary document delivery, providing general assistance to users in applying the library system and offering reference services.

## **WHEN?**

When should the strategy of libraries change, facing the evolution?

The answer is “permanently” because “change is the only constant” in the world in general and certainly in the field of information creation, distribution, storage, retrieval and usage. For many librarians this is a simple question and an obvious answer. Nevertheless it is a crucial point and it should also be realised that not all managers as well as co-workers can be completely flexible.

## **WHO?**

Who can be a good university librarian? Who should ideally be the librarians facing the challenges mentioned in this text?

To function well in an increasingly digital environment, personnel are required with new knowledge, skills, background, attitudes and expectations. In comparison with the relatively static and stable classical libraries, the digital library components are more dynamic, unstable and trendy. So personnel should be enthusiastic and willing

- to adapt many times to new methods and environments,
- to learn permanently, and
- to cope with continuous change and evolution.

## **FOR WHOM?**

For whom should the library work?

Who are the existing users / clients and potential clients? Users are changing. Also the services that can be provided based on modern ICT allow the library to reach other users. Both phenomena are related. ICT allows building information services in such a way that users can access information contents, services and systems with less physical displacement required to move towards physical, atom-based buildings and documents. A growing number of students, teachers and researchers spend less time in the buildings of the university; they communicate and they access information, all through the Internet.

This question “For whom?” is thus related to the question “How?” To make information sources accessible through the Internet, the library must provide facilities for Internet connectivity, authentication of users and authorization to access fee-based sources. Also users outside of the physical library domain can be authenticated and can be provided authorization, by using a proxy server or a VPN.

When dealing with the question “For whom?” librarians in relatively rich environments can perhaps share their wealth and experience with organizations in poor, less developed countries. In Belgium, university libraries co-operate with similar libraries in developing countries through the Flemish Interuniversity Council (<http://www.vlir.be/>). For instance, we try to contribute to the further development of the Sokoine National Agricultural Library of Tanzania (Nieuwenhuysen et al. 2000). Also, we organize short international training programs on scientific and technological information management and we provide grants to participants from libraries in poor developing countries (see for instance Nieuwenhuysen 2003 and <http://www.vub.ac.be/BIBLIO/itp/>).

## **HOW?**

How can librarians adapt to the changing environment?

What should be accomplished has first been outlined briefly above under WHAT? Going a step further, we are confronted with this question HOW? Which methods and tools are available? Which ones are appropriate and affordable taking into account the local, specific environment and budget?

To increase the transparency and integration in the procedures that users have to go through to gain access to various online information sources, librarians can make available tools such as the following.

A library web site. Many guides have been written on how to develop web sites (see for instance the book by Lynch and Horton 1999 that offers advice independent of specific development software). Some have focused on the particular case of developing library webs (see for instance Garlock and Piontek 1999, Norlin and Winters 2002, Grodzins Lipow 2003). The systems mentioned further can be offered through a library web site.

- A proxy server or a VPN or other means to allow access to fee-based information sources by members of the organization through the Internet, even from outside the physical premises of the organization.

- A system to provide access to the increasingly important electronic journals. One of many possible approaches has been implemented successfully in the author's environment (Alewaeters et al. 2001).
- An OpenURL link resolver, to guide users from some digital starting point to the most appropriate information source, taking into account the local situation concerning accessibility, coverage and addresses of information resources. Integration with the system to access e-journals is important. Such a system has also been developed in the author's university (Alewaeters and Renard 2003).
- A server for federated searching through more or less united information sources (see for instance Ramsden 2003).
- A system that offers an integrated access to a selection of sources after some personalization (see for instance Lease Morgan 2003, Neuhold et al. 2004).

Users can be assisted in finding and selecting digital information resources by information visualization techniques on the computer-based user interfaces. Information visualization is partly in the hands of the producer and distributor of information resources, but also partly in the hands of the library that acts as intermediary between information source and user, for instance in the online web site, catalogue, library portal, OpenURL resolver... Visualization of digital information on computers offers many challenges and opportunities in digital libraries (see for instance Chen and Borner 2002).

In the area of user instruction on information searching, management and usage, the following are some approaches:

- Leaflets and guidebooks can be created, printed and distributed to users. More recently, online guides can be developed and made available through the WWW.
- Training sessions can be offered to users and potential users. Such trainings can be more or less informal or formal and leading to a credit for students. The training can be more or less independent of other training activities or tightly integrated in learning activities that are closer to the core interest of the users, as a form of problem-based learning. Teaching methods and learning materials in the area of scientific information can be found for instance on the authors WWW site (<http://www.vub.ac.be/BIBLIO/nieuwenhuysen/>)

Developing and improving such instruction activities poses many challenges (see for instance Research and Scholarship Committee of ACRL's Instruction Section 2003).

Digital information systems and sources are growing in importance not only in the context of libraries. In providing and structuring access to information sources and in providing hardware and software for access to these sources, some overlap occurs with the activities of the computer center, of the developers and managers of the local intranet, and of the managers of the electronic learning environment. A hostile competition should be avoided and some form of co-operation and mutual understanding should be preferred.

Meeting all challenges is not straightforward in an environment that evolves so fast, with limited budgets. In particular relatively small libraries can be left behind due to a lack of expertise and time among the personnel. In our university, we work together with the important local public library and with a large high school for professional education in the country's capital, where fewer efforts can be spent on research and development by local personnel.

To stimulate the evolution towards open access to scientific information, the Open Archives Initiative and related actors have made several interesting contributions. These come in the form of protocols and software to create repositories and to allow harvesting of information from these repositories by further information service providers (see for instance Suber 2003, McKierman 2004, and the Open Archives Forum). Implementation of such systems in scientific organizations to improve access to their own scientific research results will perhaps become the rule, though it is now still the exception. The library can play an important role here as catalyst or even as implementer.

The number of possible adaptations mentioned above under WHAT? can thus be multiplied by a number of possible approaches for each case. This creates a map of the future for each library and librarian with many roads. To make the right decisions, librarians need to be well trained and informed. Continuous learning is imperative. Various approaches are activities in professional societies, reading the professional literature, attending conferences and tutorials and so on.

### **HOW MUCH?**

How much should a university library spend to adapt and to evolve successfully?

Changes and shifts in the library budget are needed, while a substantially growing budget is very exceptional. The value of information for an organization has always been hard to quantify. An important question for library managers is now: How to convince a university to pay not only for clearly visible services that are bound to physical documents, premises and expert personnel, but also for the more virtual, digital information sources and services?

A related but not identical question goes somewhat deeper: Who wants to pay for the value that can be added by libraries to the raw, original, digital information resources, by selecting the most relevant ones, by improving their visibility, by organizing and integrating them all in one system, by guiding users to the most appropriate sources, and so on? The list of tasks is long, and the efforts and costs involved are high. At the same time, a good digital library component is "transparent": the user should not be confronted with the expensive and required nuts and bolts to make the system run smoothly. The consequence may be however that users and higher management underestimate the required efforts that are made for the development as well as for the maintenance. In that case, budget cuts can be the results instead of applause.

So this forms a threat for the library. One way to face this is by constructive and frequent communication with all stakeholders and certainly with decision makers. A better way of marketing and branding the library services to make them more visible is another approach; a whole book is devoted to this (Siess 2003). However public relations has not received much attention by many modest and quiet librarians.

### **Conclusion**

A picture that is as sharp as that of the more classical university library has not yet emerged. One standard solution or view is unlikely to fall from the sky today or in the future. Many different and interesting approaches can be observed. So this leaves room for constructive discussions among so-called "librarians" to learn from each other's ideas, efforts, opinions, experiences, failures and successes.

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