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Digital Libraries in Europe: An educational perspective

ABSTRACT

In this paper the latest advances in developing digital libraries and hybrid libraries - those which combine traditional and digital services - will be considered from a cross-European viewpoint. Academic libraries are undertaking new roles as 'gateways' to the world's networked information resources, and they must re-organise themselves to fulfil these new roles. Of particular importance is the development of close cooperation between librarians and educators, since the use of new technology in teaching and in research requires integrated information services. Digital academic libraries will thus form part of new, integrated, technology-rich 'learning environments'.

The presenter is a former university librarian who now directs a research and development centre in a university, and has extensive experience of directing cross-European library research projects. Thus both practical and theoretical approaches will be included.

**BIOGRAPHICAL NOTE
PETER BROPHY**

Peter Brophy has been Professor of Information Management and Director of the Centre for Research in Library & Information Management (CERLIM) at the Manchester Metropolitan University since April 1998. Before that he was University Librarian and Head of the converged library and computing services at the University of Central Lancashire, and he has over fifteen years' experience as Director of major academic libraries in the UK. He is the immediate Past-President of the Institute of Information Scientists and a former Chair of the UK's Library & Information Research Group. His research interests include digital libraries, accessibility of information, lifelong learning and library performance measurement. He has directed a large number of research projects including the European Commission funded BIBDEL, SELF, EQLIPSE and EQUINOX projects.

Introduction

The topic of 'digital libraries' is receiving enormous attention around the world. However, although there have been attempts at definitions[1], there is little consensus as to what we really mean by this term. Some see it as the natural progression for long-established libraries to take, others would argue that it is an entirely new concept - traditional libraries, with their long-established collections of books and journals, will be replaced. Peter Cochrane, Head of Research at British Telecommunications, recently made the following observation:

> "Five years ago, the library at my laboratory used to occupy several large rooms and employ 30 people. It has been replaced by a digital library that is now ten times bigger - and growing fast. This digital library is staffed by only 12 of the original librarians who are now amongst the best html programmers in the company. This digital library has become an essential part of our lives and the work output has gone up tenfold in 10 years"[2]

The terminology itself is not always helpful: for most purposes the terms 'digital library' and 'electronic library' can be used interchangeably. 'Virtual library' is used to emphasise the non-physical nature of the 'collection' although it may also refer to access mechanisms where the user does not need to be physically present. However, since most libraries now deliver at least some services beyond the limitations of their walls - only last month we held the third European 'Libraries without Walls' conference in Mytilene - even that distinction may not be particularly meaningful. The terms 'complex library'[3] and 'hybrid library' are important in this context, suggesting a need for a managed mix of traditional and electronic services. Rusbridge has defined the latter concept in the following way:

> "The hybrid library was designed to bring a range of technologies from different sources together in the context of a working library, and also to begin to explore integrated systems and services in both the electronic and print environments. The hybrid library should integrate access to all ... kinds of resources ... using

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different technologies from the digital library world, and across different media." [4]

This and other definitions, and the various programmes of digital library research being undertaken around the world, have been examined in some detail in a recent report by CERLIM [5].

In this paper I want to suggest that the future of libraries must be seen within the broader context in which they operate, and that because of this some of the similarities we now see across sectors may start to disappear. National libraries will no doubt remain as vital internationally-important repositories of the knowledge and artefacts of mankind, and some academic libraries will play a similar role. But corporate libraries may be merged into dynamic 'knowledge repositories', especially in the many businesses which are themselves knowledge-based: Cochrane's remark suggests this kind of scenario, with librarians taking on entirely new roles. Public libraries, at least in some countries, may become community information and advisory centres, and maybe their functions will merge into those of citizens' advice bureau and government information centres, or perhaps they will be outreach centres for adult education – and maybe they will be all of these things. For most academic libraries, however, the situation is not at all clear. They continue to experience heavy demand from their users for traditional services, at the same time as trying to espouse the electronic future. And they operate in a climate of change, for higher education itself is facing new challenges. Some would argue that the University of Phoenix in the USA [6] is showing the way forward, with its 100% reliance on distance education through evening and independent study, employing as tutors only part-time faculty, delivering education across the USA. This new-style university offers a 'digital library' to its students and faculty [7], though as with so many distance education institutions it urges its students to use traditional libraries as well.

But there is an opposing view of the future of higher education, for there is little sign in Europe of a diminution in demand for traditional university courses, requiring 3, 4, 5 or more years attendance on-campus. What are we to make of this situation? How can academic libraries assist their institutions to thrive and prosper in this new, complex, part-networked, part-traditional but increasingly digital world?

Research Perspectives

To answer that question we need to revisit the concept of the library itself. Why do we need libraries? What role do they play? As a starting point I am still attracted to Ranganathan's 'Laws of Library Science', formulated over 50 years ago in India:

- Books are for use
- Every reader his book
- Every book its reader
- Save the time of the reader
- A library is a growing organism [8]

even if the last of these is now rather questionable and the term 'book' needs redefinition.

One of the reasons that I cite Ranganathan is that he helps us to focus on two key aspects of library service: first, that libraries are about what he called 'books' but which today we might broaden out to include all kinds of information and works of creative imagination – 'information objects' as they are now called. Second, and perhaps even more importantly, Ranganathan reminds us that libraries are about people: readers, users, patrons – that it is the use of these information objects that is central.

The role of the library may be analysed from a number of perspectives. The traditional approach has been to emphasize collection building and collection management. In essence the library's key task is to build

broader and deeper collections and to arrange for users to access those collections only on terms which ensure their long-term integrity. In this view the library is essentially a repository, and most of the activity is devoted to maintenance of that repository. Use can be almost incidental.
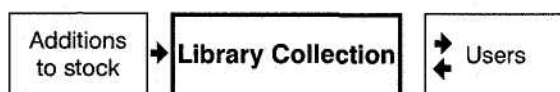
Fig. 1 illustrates this:

Fig. 1 The library as collection

A second approach has been to apply systems concepts, taken from general management theory, and to view the library in terms of resource flows and processes. Buckland has written extensively on this interpretation[10] which, in its simplest form, is illustrated in Fig. 2:

Fig. 2 Systems Model

Two important issues arise from this analysis.

Firstly, it provides a managerial perspective that recognises that all the resources which a library absorbs – not just new books and journals, but accommodation, staff, consumables and the rest – have to be managed, that they are interdependent and that they have to be acted upon by processes to produce outputs. This suggests that the library must be active rather than passive. It also follows that the efficiency of these processes and their relevance to the library's specific aims and objectives are of supreme importance.

Secondly, systems approaches focus attention on outcomes and impacts, that is on the difference that the library makes to its users. Users, instead of being incidental, are the raison d'être of the service.

The systems approach lies behind some of the most popular and influential approaches to general management and in particular it underpins the European Foundation for Quality Management's Business Excellence Model[10] . It is worth noting that approach, for it expands systems thinking in some interesting directions. Fig. 3 illustrates the model, the percentage figures showing the contribution each aspect makes to overall excellence:
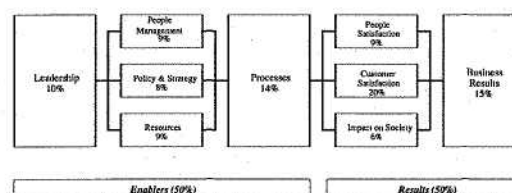

Fig. 3 EFQM 'Business Excellence' model

Particular attention should be paid to the following features:

• The division of key issues into those which enable the organisation to function and those which measure its results, which might also be called its impact;
• The heavy weighting given to 'leadership' among the enablers – higher even than the resources used;
• The inclusion of 'people satisfaction' among the results – this refers to the satisfaction of the organisation's staff with their work and their working conditions;
• The very heavy emphasis given to customer satisfaction among the results;
• Again among the results, the emphasis given to 'impact on society': for a library, perhaps this could be a measure of its contribution to the preservation of society's heritage.

Now, although these models are useful when we talk of libraries as discrete, independent organisations, each with its own dynamic leader and each serving its distinctive user groups, it is less obvious that they offer the insights we need when operating within a global, networked information 'space'. For a

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start, the information resources that the individual library treats as 'inputs' have become far more diverse, and many are not owned by the library but accessed across networks as and when they are required. They might include:

- Books published in the traditional way, electronic books and mixed media books
- Journals published in paper formats, electronic and hybrid journals
- Reports, whether paper or electronic or both
- Patents, standards, etc. whether paper or electronic or both
- Official documents, including legislation, whether paper or electronic or both
- Slides and other images in analogue formats
- Images in digital formats
- Analogue audio tapes
- Digital audio
- Analogue video
- Digital video
- Collections of data e.g. in demographic databases
- Grey literature, such as 'junk' mail, election addresses, etc.
- Web sites and individual web pages
- Java applets
- Computer files of various types
- Streamed data, such as that from satellite observation or news-feeds
- Semi-published or unpublished company records
- Dynamic documents created when they are requested
- Dynamic documents updated automatically from a remote source
- and so on

I have suggested elsewhere[11] that it is useful to refer to the total information resources potentially available in the world as the 'information universe' and the sub-set selected by a particular library – recognising that this sub-set will be dynamic – as its 'information population'.

But the information population is not all. A library may now have to address a much more diverse and dynamic population than hitherto: it will include distance learners, those registered for short courses whose membership may last only a few weeks or even less, and those with long-term membership. Furthermore the rights that different members may have to access resources may differ – so, for example, access to an expensive market research dataservice might be restricted to the MBA students. If we regard the group of actual and potential users as the 'user universe', we might term the actual eligible users at any one time the 'user population'. This leads to a symmetric model as shown in Fig. 4:

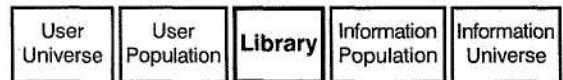| User Universe	User Population	**Library**	Information Population	Information Universe

Fig. 4 User and Information Populations

Viewed in this way, it becomes appropriate to describe the library as an 'intermediary' or 'broker' between the user and the information resources. The term 'gateway' is also used although it implies a rather passive approach. The role may better be seen as an active one, centred on creating linkages between each individual user and the information resources that user requires, whether or not these resources are owned by and stored in a library.

The 'intermediary' model of the library has been described in some detail by a number of authors [12,13,14,15] and I will not examine its characteristics in detail here. However, it is useful to note some of its implications:

- to operate efficiently in this environment, the broker library must be able to provide access to new sources quickly and easily. This implies that brokers and sources (remembering that broker libraries may themselves be sources) must be able to interoperate easily – to exchange messages, perform searches consistently, return results in agreed formats, and so on. Interoperability within the digital environment is thus of supreme importance.

Hence the key role of standards like Z39.50;

- to find new sources, the broker library will increasingly rely on a combination of expertise (some of which may in effect be 'bought in' from elsewhere, as is the case with national subject gateways) and intelligent software. This implies that we need standardised, meaningful descriptions not just of individual objects (an area where librarians have considerable expertise) but of collections. Many of the objects and collections described will not be the traditional 'stuff' of libraries. It is important, since the environment is increasingly digital, that these descriptions should be capable of interpretation by software;

- the major problem for many users will not be finding enough information, but being able to identify the most useful information from the wealth of possibilities. We have gone from information scarcity through information plenty to information plethora. To prevent users being swamped, the broker will need both sophisticated de-duplication routines and, increasingly, selective 'push' services which deliver information to the user depending on the user's individual profile of interests. Because of the size of the user population, these services must be provided automatically;

- to cope with the diverse and ever-changing user population, and the wide variety of rights given to individuals, the broker will need sophisticated, automated ways to authenticate users (i.e. to check that they are who they say they are and that they are in membership) and then to authorise them to use specific services. It is essential that the user is able to negotiate this authentication/authorisation process as smoothly as possible: solutions which require a new username/password combination at every step will simply not be acceptable;

- finally, solutions adopted by individual libraries must be capable of operating within regional, national and international frameworks. This includes responsibilities for archiving and preserving information objects of all kinds.

It is worth emphasising that these requirements, in the real world, relate not just to 'digital libraries' but to the complex, hybrid mix of digital and traditional services that characterises services as they really exist. The library that tackles this agenda seriously will develop as a centre of expertise in our emerging information society.

Educational Perspectives

Before turning to the implications of these models for the developing role of academic libraries, we need to consider the changes taking place in our immediate environment of higher education. Just as libraries are changing, so too education is undergoing a period of transition.

In Europe we do not have a uniform educational tradition or approach, and therefore we need to approach this question from a number of standpoints. Indeed, part of the richness of the European heritage lies in the differences to be found in approaches to education. In parts of Northern Europe, notably in the Scandinavian countries and in the United Kingdom, the focus is on what are called 'student-centred' approaches. Following trends discernible in North America, these pedagogical approaches increasingly rely on packaged course materials, on independent and group learning and on the role of the tutor as a 'facilitator' of learning. In Southern Europe and in Germany, the dominant view is of a teacher-centred pedagogy, where the emphasis is on the expert teacher imparting knowledge. Again, however, learning packages are coming into use, symbolic of changing paradigms. This is not the place to argue the merits of each pedagogical approach: indeed if any argument is appropriate it would be of the need to draw on the strengths, and hopefully avoid the weaknesses, of each method. In passing, it

is worth noting that these differences are nothing like as pronounced when one comes to consider research, witness the considerable success of European Commission programmes in bringing together multi-national research teams.

However, what is clearly important is that the library should support the teaching and research of its parent institution in an appropriate manner. The trends within institutions are therefore of the utmost importance for the library. What, Europe-wide and world-wide, are those trends? I would like to highlight seven:

- an increasing use of new technology in delivering education within institutions, as evidenced by the numbers of PCs on campus;

- the development of increasing numbers of learning packages. While institutions have not shown much enthusiasm for using packages designed and created elsewhere, the economics of educational delivery may make this essential in the future;

- pressure from employers to ensure that graduates have the right mix of skills and knowledge to be valuable in the world of work, and criticism of higher education when it fails to deliver employment-ready graduates;

- linked to that, an emphasis on the external audit of universities to ensure that they are accountable for the resources they expend and that they provide research and education of the highest quality;

- concern to address the issue of 'lifelong learning' (what the Delors Report on learning called the "heartbeat of society"[16]) and in particular that of the re-skilling of graduates within their professions;

- enormous interest in the delivery of education across the Internet. Most established universities are not yet heavily involved and have done little more than test the market. But virtually all observers predict heavy growth in this area, and the threat from new Internet-only providers, like the University of Phoenix, has to be taken seriously. Newer universities, and those with a pre-dominantly teaching mission, may be particularly vulnerable;

- finally, the internationalisation of research, so that leading-edge work is now most commonly achieved by groups of researchers, drawn from different institutions and countries, working collaboratively.

Implications

If we try to draw together trends in education with the developments in digital libraries of which I spoke earlier, what future might we see for the academic library? There are pessimists who would argue that, apart from the archival function of the major, older university libraries, academic libraries have no future since anyone, anywhere can pick up the information they need from the Internet. I would wish to make the opposite case.

Let us depict the current situation as that shown in Fig. 5, with the 'learning event' (whatever we may interpret that as meaning) at the centre and a series of supporting activities surrounding. Learning itself is enabled and supported by lectures, by the provision of study environments of different types, by IT tools such as word processing and spreadsheet packages, data-bases and so on, by tutorials and seminars, by assessments – whether examinations or dissertations – by groupware communications tools, by learning packages and by the library. The institution draws on the external world through the library for access to the information universe, but also through other agencies, including faculty members themselves, for pre-recorded lectures and learning packages available world-wide.

Pre-recorded lecture universe	lecture	Study environ-ments	IT tools (WP,SS,DB etc.)
Information universe	Library	**Learning Event**	Tutorial/ Seminar
Learning package universe	Learning package delivery	Groupware	Assessment

Fig. 5: The traditional library (shaded area) provides access to the information universe
(The university itself is depicted by the wavy line)

A case can be made that the library has the opportunity to expand its sphere of influence within the institution: it could provide access to the wealth of pre-recorded lectures available from experts in every discipline; it already provides study space and could administer other spaces outside the library building; converged library and IT services, very much the fashion in the UK and not unknown elsewhere, could take responsibility for providing all the IT-based tools the student or researcher needs; just as there is a universe of information objects so too there is a growing universe of learning packages which will need experts to provide selection and access services; tying all this together is the groupware which enables students to work together across the networks. Is not the library the logical agency to co-ordinate and bring together all of these facilities?

The basis of such expansion of role is the digital library: it provides the infrastructure and expertise in handling digital objects of all kinds, in describing them, in interoperability, in authentication and authorisation, and in all the other skills needed to build truly integrated learning environments. Of particular importance, the digital library provides expertise in 'gluing together' all of the constituent parts of the learning environment: interoperability of systems, scalability across and between organisations, sustainability and authentication of individual users.

What, then, is left for faculty members to do? Essentially, the design of the 'learning event'

itself, the tutorials and seminars which support it and the assessment of the student's performance. These are the core tasks which the faculty will be required to perform, and which they need to be free to perform rather than spending their time searching the networks and building non-scalable, non-sustainable applications.

Pre-recorded lecture universe	lecture	Study environ-ments	IT tools (WP,SS,DB etc.)
Information universe	Library	**Learning Event**	Tutorial/ Seminar
Learning package universe	Learning package delivery	Groupware	Assessment

Fig. 6: Could the new academic library (shaded area) co-ordinate access to a much wider range of learning support in an integrated learning environment?

While this utopian vision of the library taking over more and more major functions in the university is probably over-optimistic, it does point to some of the ways in which the library may extend its influence. Almost certainly the key to the achievement of such a major role lies firstly in collaboration between faculty and librarians and secondly on a view of digital library developments as providing both infrastructure and expertise which is much more widely applicable than simply to libraries as we have known them.

Conclusion

What, then, is needed to make such collaboration a reality and thus to secure the library's place in the university? I would like to suggest five key steps:

- we need to work closely with faculty to transform libraries and turn them into learning environments instead of seeing our future in building the library empire.

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In other words libraries must become more central to the learning experience and be open to new ways of operating;

- librarians need to develop a much better understanding of pedagogical issues – they need to understand learning, so that they can contribute to these learning environments;
- we need to refocus attention on the fact that libraries are far more than repositories of recorded information and that their digital systems and expertise have much wider application than even they have recognised;
- at the same time, we need to capture our institutions' attention and imagination with a concept of libraries as the guardians of the memory of mankind, to alert them to the danger of it leaking away through the holes of the new electronic nets, and to expand our horizons beyond the information objects with which we have traditionally dealt;
- we need to be leaders in the development of sustainable, networked services which are robust enough to contribute to national and international services.

Such is the strategic and research agenda which the twin challenge of digital libraries and educational change present to the academic library. But above all librarians must rediscover a passionate commitment to education itself and a determination to be part of the new educational movements of our time. Let me end with a further quotation from the Delors Report, 'The Treasure Within'[17]:

"Our century has been as much one of sound and fury as of economic and social progress – progress that in any case has not been equally shared. At the dawn of a new century the prospect of which evokes both anguish and hope, it is essential that all people with a sense of responsibility turn their attention to both the aims and the means of education .... While education is an ongoing process of improving knowledge and skills, it is also – perhaps primarily – an exceptional means of bringing about personal development and building relationships among individuals, groups and nations."

That is the real challenge for academic librarians in the 21st century.

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