Library management systems

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1. General overview

In one of the first papers on library management systems (LMS) in the UK to be published during the review period of 1991-2000, Arfield [1] describes how the changing economics of computing resulted in staff at Reading University Library wishing to move away from a system shared between various libraries to an integrated library management system under local control. Reading had been a member of the SWALCAP (originally standing for the South Western Academic Libraries Co-operative Automation Project) which had provided shared cataloguing and circulation services to a number of academic libraries in the UK since 1979. However, ageing equipment was becoming increasingly unreliable and staff at Reading felt that the SWALCAP service was unable to cope with the increasing number of terminals that were required for the users. This situation was replicated in other academic and public libraries at the start of the 1990s and many moved over, or migrated, to integrated library management systems (in Reading's case the LIBS 100 system from CLSI was chosen). Jones [2], of the House of Lords Library, describes how the decline in the number of customers of the shared services resulted in the decision by SLS (SWALCAP Library Services) to withdraw this service. Following a study undertaken by an external consultant (when it was recommended that a multi-user integrated LMS be chosen) a decision was made to implement the ADVANCE system from the company Geac in the House of Lords. Another reason for libraries choosing to replace their LMS during this period was the fact that some LMSs were not designed to cope with dates in the 2000s –i.e. they were not Year 2000 (or Y2K) compliant.

Many of the integrated LMSs, such as CLSI's LIBS 100 and Geac's ADVANCE, were developed during the 1980s so that by the 1990s these comprised a number of modules to cover the general library housekeeping functions of:

- Cataloguing – creating records for material held in the collection
- Circulation – keeping track of who has what item from the collection on loan
- Providing access to the catalogue – via an Online Public Access Catalogue (OPAC)
- Acquisitions – selecting and ordering items for the collection and maintaining the accounts
- Serials control –managing the acquisition of serial publications and so dealing with challenges such as claiming for missing issues.
- Interlibrary lending – to enable books and serials to be borrowed from different libraries.

Most LMSs are now integrated, i.e.data is only held once by the system and is then used by all the modules and functions. This has an obvious benefit as a search of an OPAC can inform the user as to the number of copies of the title are held, where they are housed, as well as whether or not they are out on loan, and if so when they are likely to be returned.

The libraries of the early 1990s, be they public, university, college, medical, government, legal, industrial, or school, dealt primarily with printed materials such as books, reports, scholarly journals and so on, as well as what were referred to as non-book materials, such as films, videos, tape-slide productions, CD-ROMs and so on. However, by the end of the 1990s the huge impact of the Internet and the World Wide Web meant that staff in libraries increasingly were involved in not just managing the

collections housed physically within the four walls of their library building but were also involved in providing access to a vast range of digital information sources of potential relevance to their users which were housed outwith the library building. This mixture of providing access to print and digital collections caused some writers, e.g. Oppenheim and Smithson [3] , to refer to the development of the hybrid library.

For staff working in libraries in the early 1990s the LMSs were, for many, their first experiences in using computers. By the end of the 1990s though, following much training in Information and Communications Technology (ICT) as part of the Electronic Libraries Programme (eLib) in the UK's academic libraries (Rusbridge[4]) and the People's Network in public libraries (Library and Information Commission [5]) staff became much more familiar with using computer systems. The functionality required by LMSs inevitably evolved during the 1990s and some suppliers kept pace with technological developments whereas others failed. Another development of the 1990s was that many smaller libraries were able to afford to buy LMSs as systems began to cost thousands (or in some cases hundreds) of pounds rather than hundreds of thousands of pounds.

A number of books appeared during the decade providing, inter alia, advice to librarians involved in selecting and managing LMSs. Examples include Clayton with Batt[6] , Harbour[7], Rowley [8 9] and Tedd [10]. *Managing the Electronic Library* [11] covers a wider area than LMS with 40 contributors, mainly from the UK academic community. The main theme of this book is change and how staff in university libraries were responding in the 1990s to the rapidly changing higher education system in the UK with its increasing student numbers and greater diversity and requirement for flexibility of access to information. For many libraries the challenge relating to LMS was not necessarily choosing a new system 'from scratch' but migrating from one system to another as described earlier. Muirhead's book[12] includes a number of case studies written by library staff from a range of different types of library describing their experiences in migration. Muirhead also edited the British version of a book[13] on planning for library automation which was written in the US.

2. Brief descriptions of some of the LMS available

In this section brief descriptions will be given of some of the LMSs used in UK libraries between 1991 and 2000. Further details are provided in the excellent directory of 30 LMS compiled by Leeves with Russell [14] through funding from the British Library Research and Development Department (BLR&DD) under the auspices of the Library Information Technology Centre (LITC) at South Bank University in London. The LITC was a centre which, in 1991, moved from its former base at the Polytechnic of Central London to the then South Bank Polytechnic. LITC was funded by the BLR&DD to offer impartial advice on LMSs and general automation projects to librarians and information professionals. Staff at LITC were involved in a number of activities related to LMSs including the production of briefing documents, guides (e.g. [15 16]) , introductory packs (e.g. for special sectors, such as school libraries[17]), providing consultancy advice to individual libraries choosing a new LMS, being involved in funded research work and publishing the journal *Vine*. The Leeves with Russell directory was based, in part, on an earlier directory (Leeves et al. [18]) of some 29 LMS in Europe; of these over 50% referred to LMS used in UK libraries at that time. Other references to case studies describing

particular implementations have, in the main, been taken from the journals *Program: electronic library and information systems* and *Vine.*

ADLIB

This LMS was initially developed in the 1980s by Lipman Management Resources of Maidenhead and in the 1990s was supplied by Adlib Information Systems. Leeves with Russell record 11 users of ADLIB in the mid-1990s most of which, ten, were special libraries. An example of a library and information service implementing ADLIB is provided by Wilsher[19] who describes the decision made by the Advisory, Conciliation and Arbitration Service (ACAS) to choose the catalogue, OPAC and acquisitions modules of this system to replace the previous BookshelF system used when ACAS was part of the UK government's Department of Employment.

ALEPH 500

Ex Libris developed its first LMS, the forerunner of the ALEPH 500 system, for the Hebrew University in Jerusalem in the 1980s and it became a popular system in Europe. The first customer for ALEPH 500 in the UK was King's College London (KCL) which, in 1996, was looking for a new LMS to replace the soon to be defunct LIBERTAS system. Sudell and Robinson [20] describe that procurement process and explain how its use of industry standards (Unix, Oracle, Windows, SQL etc.) was one of the major reasons for its being chosen for King's. Many other academic libraries followed KCL in choosing ALEPH 500 including Bristol, as described by King[21].

ALICE

This LMS originated in Australia and was introduced into the UK market in 1992. It is primarily aimed at school libraries and has proved to be popular with Leeves with Russell recording some 320 users in special, college and prison libraries as well as in schools. Darroch [22] provides a brief description of the place of ALICE in the LMS marketplace in the late 1990s.

ALS

Automated Library Systems (ALS) is a British company that has been involved with computer-based library systems since the late 1960s when it developed a special device based on punched paper-tape for automatically recording details of books and borrowers at a library's issue desk. During the 1990s the suppliers developed a version of the ALS System 900 which would run on open systems platforms (as opposed to the previous proprietary hardware and software solution) as well as dealing with Electronic Data Interchange (EDI) developments in the acquisitions module. Ashton[23] describes how EDI with ALS was used at Hertfordshire Libraries Arts and Information Service.

BookshelF/Genesis

BookshelF originated as a microcomputer-based software package developed in the 1980s for the Cairns Library at the John Radcliffe Hospital in Oxford. However, by the 1990s the multi-user system of BookshelF became known as Genesis and was marketed by the Specialist Computer Group (SCG). Rowley [24] describes how this LMS was one of the first to run as a Windows product with a

graphical user interface (GUI). Further details of BookshelF are provided by Fisher and Rowley [25]. Leeves with Russell report that takeup of this new LMS had been quite rapid during the early 1990s with there being 37 customers (mainly college or small academic) including both previous BookshelF customers which had upgraded to the new improved system as well as new customers.

CAIRS-LMS

The Computer Assisted Information Retrieval System (CAIRS) was initially developed as an inhouse information retrieval system for the Leatherhead Food Research Association in the mid-1970s. CAIRS-LMS was developed to complement this and was used by those libraries in the 1990s which typically had sophisticated information retrieval requirements and comparatively low numbers of loans. Perrow[26] describes the upgrade from the microcomputer version of CAIRS (MicroCAIRS) to CAIRS-LMS at Templeton College. Leeves with Russell record 218 users of CAIRS-LMS, the vast majority of which were special libraries. Bennett and Tomlinson[27] describe the use of the interlibrary loans module of CAIRS-LMS at the library of the Institutions of Electrical Engineers.

DataTrek

This LMS originated from software developed in the US but by the 1990s some UK special libraries were using it. Hoey[28], for instance, describes its implementation at the Royal Society of Chemistry (RSC). As similar learned societies, the RSC had been using online information retrieval system since the 1980s and by the 1990s realised the need for a complementary LMS. In 1996 DataTrek, by then part of the Dawson Holdings group, acquired Information Management and Engineering (IME) the producers of the Tinlib software.

Dynix/ Horizon

The history of Dynix up to the early 1990s is provided by Gilmartin with Beavan[29] who were responsible for implementing this LMS at Glasgow Caledonian University. The original Dynix LMS was developed in the US in the 1980s and Leeves with Russell state that there were 68 users of this LMS in the UK in public, university, small academic/college and special libraries. During the 1990s a client-server LMS, Horizon, was marketed by the firm Ameritech Library Services, which had merged with Dynix during the 1990s. Hackett and Geddes[30] describe the Horizon LMS noting that it was truly scaleable with installations in small special libraries as well as large multi-site academic libraries, although they also note that it might have been argued that Horizon was marketed too early in the UK in 1995, when the product lacked depth of functionality required to deal with the needs of large multi-site universities. However by 1998, when universities including Huddersfield, Middlesex, Staffordshire, Strathclyde and Birkbeck College, University of London had implemented Horizon the feeling was that customers were " beginning to reap the benefits of its fully graphical, client/server construction". In 2000 Ameritech Library Services became known as epixtech Inc.and continued to supply existing products as well as web-based solutions and services.

Galaxy

The Galaxy 2000 LMS, from the British firm, DS proved to be a popular system, particularly in public libraries, during the 1990s. Neary[31] describes how

Birmingham Library service, the biggest metropolitan library authority in the UK with 40 community libraries and the busiest lending library in Europe installed the Galaxy 2000 LMS in 1994 and the upgraded it to a newer version in 1999. Galaxy 2000 offers the usual LMS modules but also has a separate issuing function for use of the Birmingham's housebound service. The OPAC module of Galaxy is known as ViewPoint and there have been some 230 ViewPoint terminals located throughout Birmingham since 1994.

Geac

This Canadian firm Geac first installed its Geac Library Information System in a UK library in 1979 and this software ran on proprietary hardware and was used in several UK libraries in the 1980s. In 1988 Geac acquired an American company, Advanced Libraries, and developed its software, ADVANCE, to run under the Unix operating system and this became its main LMS offering in the 1990s. For instance, in the mid-1990s Edinburgh University upgraded its previous Geac (Geac 9000) system to ADVANCE, Newcastle University chose this system as did the public library at Hamilton District Libraries in Scotland, the National Library of Wales and the Bodleian Library at the University of Oxford. A history of library automation at the Bodleian, including the implementation of the DOBIS/LIBIS system in the late 1980s is provided by Crawshaw[32] and Burnett [33] describes the 1995 decision to migrate to ADVANCE along with an assessment of the impact of automation on such a large organisation and a catalogue of some eight million items. Geac ADVANCE was the basis for the Oxford Library Information System (OLIS) that provided library housekeeping services for many of the Oxford colleges, academic libraries within the university as well as the copyright library. During the 1990s Geac also acquired CLSI and its LIBs 100 LMS and marketed this for some time.

Heritage

Heritage, like Genesis, was developed from the original BookshelF software although Heritage was initially a single-user system, and was marketed by Logical Choice (which became known as Inheritance Systems during the 1990s) in Oxford. Alper [34] describes the implementation of Heritage in a small one-librarian medical service and concluded that this LMS had proved to be a great time-saver in issuing and claiming books and had excellent statistical reporting facilities. In 1997 the library at the Central School of Speech and Drama, having outgrown its previous LMS, needed a new system. Edwards [35] describes the selection process for this new system which resulted in a short list of four LMS ranging in price from £3,000 - £27,400. Heritage was chosen (at a cost of £11,350) and the paper describes some of the innovative features of this LMS.

INNOPAC/ Millennium

Innovative Interfaces Inc. (III) is an American company which started to market the INNOPAC LMS in the UK in the early 1990s with the first customer being the library at the University of Wales, Bangor. In 1995 staff at the University of Hull, as described by Leeson [36], chose INNOPAC to replace the previous Geac 9000 as it had improved functionality. In 1997 III acquired the UK company SLS and its LIBERTAS software. Towards the end of the 1990s III started to develop

its Millennium system which, inter alia, provided a web-based interface for each module. Users of Millennium in the UK included Sheffield Hallam University, St. Andrew's University, and St. Mary's University College in Twickenham. The School of Oriental and African Studies at the University of London chose Millennium because of its proven ability to deal with Chinese, Japanese and Korean material. Myhill[37] provides a personal insight into the challenges faced at the University of Exeter in migrating from the LIBERTAS LMS to Millennium.

LIBERTAS

The stand-alone LMS LIBERTAS, of SLS, was designed with assistance from many of the systems librarians who were working in the libraries of member universities of the SWALCAP co-operative. LIBERTAS was launched in 1986 and initially incorporated modules for cataloguing, OPAC, and circulation control. Leeves with Russell report 46 users of LIBERTAS in UK libraries by the mid-1990s. Bradford[38] outlines the advantages and disadvantages of using the ILL module of LIBERTAS at Bristol University, which was an original member of SWALCAP. In 1997 SLS was sold to III and support for the LIBERTAS system declined.

OLIB

Smith[39] describes how the Bar Library in Belfast which serves all practising barristers in Northern Ireland implemented the OLIB LMS from the British firm Fretwell Downing in 1996. The requirements for this special library included the need to provide a document management/delivery service for members as well as an efficient system for managing the library. Initially the Bar Library used the cataloguing, circulation and OPAC modules of OLIB with the intention of implementing the acquisitions and serials modules at a later date.

Talis

The other early co-operative for library automation in the UK was BLCMP- or Birmingham Libraries Co-operative Mechanisation project. Like SWALCAP it had developed stand-alone software for its members which, in the early 1990s, was known as BLS – BLCMP's Library System- and included modules for acquisitions, OPAC, circulation control and serials control. In 1992 BLCMP announced a new Unix-based system known as Talis. Like LIBERTAS, Talis had been designed in conjunction with the co-operative's member libraries. It was based on a modular principles using computing industry standards for an open systems design. Among the early users of Talis were the John Rylands Library of the University of Manchester and the public library of the Royal Borough of Kingston upon Thames. Leeves with Russell report 30 users of Talis in the mid-1990s, most of which were university or public libraries in the UK. Wilson [40] describes the experiences of migrating from BLS to Talis at Nene College, the first institution to undertake this migration and produced a lengthy list of 'morals of migration'. In 1999 the organisation supplying Talis ceased being a co-operative of member libraries and became a commercial company. This decision followed much consultation with the members of the co-operative and the new company stated that strong customer relationships and customer focus would remain central to the culture of the business.

Tinlib

Tinlib, also known as the Information Navigator, was developed by the British firm IME in the 1980s. It was one of the earliest systems to offer a navigational facility and to make use of Windows for display and selection of data. Leeves with Russell report that there were 315 users of Tinlib in the mid-1990s in the UK although a full customer list was not supplied. Chappell and Thackeray[41] outline the need for an automated system to replace the existing manual systems at the library of the Arts Council of Great Britain and how the use of Tinlib had increased the effectiveness and efficiency of the library and made its collections much more accessible.

Unicorn

Haines[42] describes her experiences during 1990 in attempting to negotiate the acquisition of an American system, Unicorn, from the Sirsi Corporation, which was previously not available in Europe, for use in a British independent health fund, the King's Fund. Sirsi was determined not to enter the European market without a partner with expertise in library software support and with the necessary technical skills in Unix systems. This was finally achieved and the system was successfully launched in the UK in 1991. Leeves with Russell reported some 37 users of Unicorn most of which were medical, legal or government libraries. Cree[43], for instance, outlines how Unicorn was introduced into the UK government's Department of Health library where it needed to be integrated with the Department's office information system and added to a large network with multiple applications. By the end of the 1990s Unicorn was used in a variety of libraries including the Cheltenham and Gloucester College of Higher Education, the London School of Economics, the Royal College of Nursing, the Royal Veterinary College, and the library at the Natural History Museum.

Voyager

Endeavor Information Systems was formed in the US in 1994 and its first product was its Voyager LMS. The WebVoyage module of Voyager allows web browsers to query the Voyager database, which is based on the Oracle relational database management system. Voyager became the LMS of choice for a number of libraries looking for new systems following the demise of LIBERTAS. In Wales , for instance, the university libraries of Aberystwyth, Cardiff, Lampeter and Swansea as well as the Welsh College of Music and Drama were all faced with choosing a new system and they decided to approach the selection process in a consortial way, as described by West[44]. Each institution was free to choose its own system following the selection process. In the event all chose Voyager from Endeavor and these systems were implemented, with differing OPAC interfaces in 1999. Knights[45] outlines the procurement and migration experiences at Hertfordshire University Library in moving also from LIBERTAS to Voyager.

Inevitably not all the LMSs offered all modules in a way that satisfied all staff in libraries. In the 1990s there were some examples of libraries which had one LMS for most of its applications but used another for a specific function. For instance, Edwards[46] describes that although Croydon Libraries had automated its circulation and stock control procedures for many years a decision had been made to delay the automation of the acquisitions processes as the LMS in place (CLSI's LIBS 100) did not satisfy the needs of the acquisitions staff. In 1997 the acquisitions module from

ALS's Meritus LMS was used, in conjunction with a network solution for EDI ordering and invoicing was implemented. The requirements for interlibrary loans (ILL) within the UK which for many libraries involves the use of the centralised British Library's Document Supply Centre have not always been met by LMSs, particularly those developed outside the UK. Leeves[47] describes solutions for automating ILL in the early part of the 1990s and Prowse [48] describes the process of developing an ILL module for the ALEPH 500 LMS that had been installed at KCL.

3. Reports in the literature of overviews of LMS during 1991-2000

Apart from the Leeves with Russell directory which includes details of users of the different LMS there have also been other studies and surveys undertaken during the period. In 1991 Blunden-Ellis[49] reported on an update to a previous survey and aimed to provide an analysis of the UK market for LMS in a form that complemented the US annual LMS marketplace survey (e.g. Bridge[50]). The data for this market analysis was retrieved from questionnaires sent to LMS suppliers including ALS, BLS, CLSI, DS, Dynix, Fretwell Downing, Geac, IME and SLS. He concluded that DS was the overall market leader and that there was plenty of evidence of suppliers enhancing their products. In conclusion he stated that " This market will become increasingly competitive on economic, geographic and technological levels and so no vendor, even with a good current share, can confidently expect a 'blue skies future. Investment in research and development and customer satisfaction remain the key activities for the immediate future." By 1992 Blunden-Ellis[51] reported that BLS had the market share with SLS as second. These were both established major forces and newer suppliers in the market at that time, i.e. Dynix and IME were performing well. In the final survey in this series Blunden-Ellis and Graham[52] extended the coverage of their questionnaire as it was sent to 38 suppliers identified by the LITC and 29 responses were received. Previous surveys had concentrated on larger LMS suppliers and since this survey included many smaller LMS suppliers a total of nine market segments was identified. The Web was just beginning to impact on libraries at the time of this last survey and the final point made was that library housekeeping systems will become just one of a suite of services designed to deliver packaged information quickly and effortlessly.

A different perspective on the use of, and growth of, LMS in public libraries in the UK has been provided in other surveys. In 1991 Dover[53] reported on a survey undertaken through funding from the UK government's Office of Arts and Libraries through the BLR&DD. Questionnaires were sent to 109 public library authorities and 95 responses were analysed. Of these only 15 had no computer-based system in their library and some 23 had been using computers for over 15 years. The four main service objectives identified for using computers in libraries at that time were:

- Better stock utilisation
- Improved throughput
- Better management information
- Better access to services.

Batt, then of the London Borough of Croydon, carried out a series of six surveys of information technology in public libraries between 1984 and 1997. Comparisons year on year though are problematic given various local government reorganisations, such as that in 1997. In the sixth edition[54] he reported that 95% of the 168 authorities surveyed had some form of automated circulation system in at least one service point. This compared with 82% in the previous survey of 1993. He also found that 38% has

an automated circulation system in all their libraries. Table 1 shows some of the LMS used.

Table 1 LMS used in public libraries as reported by Batt in 1997

	1993	1997
ALS	9	13
BLS	15	32
CLSI/GEAC PLUS	11	9
DS	28	36
Dynix	15	20
Genesis		8
Unicorn		1

Availability of an OPAC had featured on Batt's questionnaire since 1985 and his report shows the shift from seven authorities with some form of OPAC in 1985 to 143 in 1997 – a considerable shift. Automated acquisitions were reported in 76% of the authorities and 26% (44 of the 168) were also using EDI to communicate with a range of suppliers.

An intriguing view of LMS in the 1990s is provided by Heseltine [55] who outlines the history and current state of the LMS market using the stages through which Christian passes in *Pilgrim's Progress*. The 'delights' to be found at the end of the journey were described as:

- improvements in the user interface. He noted that many of the LMSs were developed from systems of the 1970s and 1980s which had rudimentary user interfaces
- access to a wider range of information
- improved management information
- systems designed for end users and not library staff
- implementation of standards.

Yeates[56] also wrote about how the LMSs of the 1990s reflected a conservative view of the library as a passive repository which took little account of the needs of the users and of the possibility of dynamic interaction.

However, in a study of 10 libraries from the academic, public and special sectors which had purchased library management systems in the mid-1990s Murray [57] found that some of Heseltine's 'delights' had come to pass as he noted the following:

- New generation LMSs are more flexible (portable and easier to use, more powerful in terms of connectivity) and incorporate industry standards.
- New LMSs are less staff intensive (in terms of support and backup).
- More suppliers now offer software only packages.
- Client/server systems and Windows-based LMSs have yet to become a mandatory requirement in the procurement process.
- Some of the libraries had taken the views of their end users into account when having systems demonstrated.
- The production of management information remained an area of difficulty for some systems.
- There was unanimity in the belief that Web developments in terms of software being provided by sippliers and the ability to link from the LMS to the Internet would dominate the marketplace.

Raven [58] provides a very general review of the LMS marketplace for academic libraries in 2000 and notes that "Deciding on a new library management system has become much more difficult for universities in the UK in the last two years. The range

continues to expand rapidly and if you've grown with your present system for the last ten years or so , change can be a frightening prospect."

4. Some developments in LMS between 1991-2000

Akeroyd[59] provides an overview of integrated LMS towards the end of the decade in his introductory paper to a special issue of *Vine* on LMS in 1999. His developments have been used as a basis for this section although other aspects have also been added.

Technological developments

Many of the early LMSs used their own specially developed operating systems. However, during the 1990s many suppliers moved to developing systems that ran on the Unix operating system. Similarly many of the early LMSs were designed around specially developed database management systems. During the 1990s there was a move away from these to industry standard relational database management systems such as Ingres (used by Galaxy 2000), Informix (used by Unicorn), Oracle (used by ALEPH and Olib) and Sybase (used by Horizon and Talis). Another technological development of the 1990s was the adoption of the client-server architecture. In this model a split is made between the applications software (which runs on a computer known as the client) and the database software (which runs on a computer known as the server). The two communicate with each other over a network using a communications protocol (or set of rules). Processing which involves data manipulation or aspects of screen display can be carried out on the client computer and only database queries from the client and responses from the server need to be communicated across the network.

Self service

An important development during the 1990s was the installation of self-issue and self-renewal machines in libraries so that users can issue and return their own books. The library at the University of Sunderland was one of the first to use machines from the 3M company for this purpose. Stafford [60] describes this service and highlights the four Ps (preparation, publicity, position and persuasion) necessary for a successful implementation. In 1996 a conference was held at Sunderland on self-issue systems and its proceedings[61] contain a number of case studies. A special issue of *Vine* was published in 1997 on self service in libraries and Cookman[62] describes the introduction of a 3M self-issue terminal at Maidenhead public library. The general experience was that library staff accepted the benefits of the new terminal and that on busy days queues had reduced noticeably. However, when the issue desk was quiet it appeared that users preferred the human approach to issuing and returning materials.

Messages to users by e-mail or text

With many users having access to e-mail and/or mobile telephones some LMS have incorporated the facility to use these technologies for sending overdue notices, alerts for reserved items or other communications. Sudell and Robinson[63] note that the reader record in the ALEPH 500 system at KCL can hold a variety of addresses. If an e-mail address is entered then that will be first in line, if not the system can handle multiple postal addresses so that an appropriate address may be used depending on whether it is term time or vacation.

Improved accessibility via the OPAC and use of the Z39.50 protocol

OPACs have always been designed with end users in mind and so the interfaces that have developed over the years from the command-driven and menu-based systems at the start of the decade to the form filling on Web pages have all been intended to be straightforward to use. However the information that is searched i.e. the records in the catalogue database are often stored in MARC format which has little information to support elaborate subject searching. The 856 field of MARC allows the inclusion of a URL into the bibliographic record by the end of the 1990s some OPACs were using this to provide links to digital objects..

A further development of the 1990s related to OPACs was the Z39.50 standard. As defined by Dempsey et al.[64] Z39.50 is " a retrieval protocol which allows client programs to query databases on remote servers, to retrieve results and to carry out some other retrieval-related functions." The main impact of this is that it enables users to, say, search the OPAC of a neighbouring library (which might perhaps use the Horizon LMS) using the same user interface as the local library (which might be based on the Talis LMS). For this to happen the relevant LMSs need to have appropriate software to make them Z39.50 compatible. A list of LMS with this capability is provided by Dempsey et al. and includes: ADVANCE, ALEPH, DataTrek, Dynix, Horizon, INNOPAC, LIBERTAS, OLIB, Talis, Tinlib and Unicorn. Brack[65] describes the RIDING Project which resulted from one of the eLib Programme's large scale resource discovery (clumps) projects and which provided a Z39.50 Search and Retrieve facility for all the Yorkshire and Humberside university OPACs, plus the British Library Document Supply Centre databases and the Leeds Library and Information Service OPAC.

Catalogue record provision

Most LMS allow for original cataloguing of bibliographic records as well as for allowing the import of, usually MARC, records from external sources. Although not all LMSs use the MARC record for internal processing of records they usually do include the ability to input or output records in this format. The early UK co-operatives of BLCMP and SWALCAP developed large databases of MARC records which proved valuable to the cataloguers of their respective member libraries. Many of these records have now been incorporated into the OCLC database in the US and made available internationally. Retrospective cataloguing of materials held in libraries continues and Bryant's report[66] outlines the issues, opportunities and need for a national strategy in this area.

Examples of consortial working

Although the BLCMP and SWALCAP co-operatives had disappeared by the end of the 1990s there were several examples of other consortial projects and systems related to LMSs. Some of these consortia were formed as part of the eLib Programme, others, such as the Welsh academic libraries already mentioned were linked with the sharing of resources for the procurement of a new LMS.

COPAC

COPAC is the OPAC of the Consortium of University Research Libraries which provides free access to the merged catalogues of 20+ major university research libraries in the UK and Ireland. Cousins[67] describes the development of COPAC and its launch in the mid-1990s. COPAC is an example of a physical merged catalogue i.e. all the records from all the libraries are combined into one database and checks are

made to identify duplicate records. During the 1990s COPAC was available via a text interface as well as a Web interface.

M25 consortium

The M25 Consortium of Academic Libraries was formed in 1993 with the aim of fostering co-operation amongst its London-based, higher education member libraries in order to improve services to users. In 1998 the M25 Link project was funded as part of the eLib Programme and aimed to establish a pilot virtual clump to provide single search access to the library catalogues of six members of the M25 Consortium. The project consisted of a seamless search tool, using the Z39.50 protocol, to the OPACs of the six pilot partners which between them had a range of LMSs including: Horizon, INNOPAC, Libertas, Talis and Unicorn. An overview of the work undertaken by the M25 Consortium is provided by Enright[68].

Foursite consortium

Froud [69] describes the Foursite consortium of four public libraries in the South West of England which came together to identify replacement computer requirements and which subsequently went on to share a single LMS operated by one of its members, Somerset. The Foursite consortium demonstrated that significant cost savings could be achieved at all stages in the process of specifying, selecting and implementing an LMS provided:

- political support and enthusiasm by members of the consortium
- flexible management in all authorities who were prepared to make sacrifices in the interest of the consortium's objectives, coupled with an openness that precluded any hidden agendas
- tight project management
- clear terms of reference for individual groups and clear ground rules
- good communication systems
- expert technical advice.

Use of project management methodologies

There was some evidence during the 1990s of project management methodologies being used for the procurement and implementation of LMSs. Lewis[70] describes the use of the PRINCE (Projects IN Controlled Environments) methodology at the University of Wales Bangor for the procurement, in conjunction with the North East Wales Institute, of a replacement LMS. PRINCE is a project management methodology used within government departments. Chambers and Perrow[71] report on a questionnaire carried out as part of a study on the sue of project management methodologies generally in university libraries in the UK. Of the 80 university librarians who responded, 28% had used project management software – and the most popular software was Microsoft Project.

Closer links between LMSs and archives

Suffolk County Council's Libraries and Heritage is an example of an organisation which covers public libraries, record offices, arts and museums. Suffolk had installed its first LMS (a batch system to deal with circulation in conjunction with a microfiche catalogue) in 1980. By 1987 this had been replaced with an LMS using proprietary hardware, software and communications which managed circulation, acquisitions, cataloguing, community information, the OPAC, e-mail,

dial-in facilities and management information. In 1995, when the time came to replace this LMS, the aim was to provide a system which would use generic hardware, software and communications which would provide a networking infrastructure to bring Internet access to all branches and which would also serve the needs of Suffolk's archives and museums. Pachent [72] describes the procurement process which resulted in the acquisition of DS Ltd's Galaxy 2000 and the CALM 2000 systems. Closer links between LMSs and archives in the public sector was enhanced during the decade by the formation of the Museums, Libraries and Archives Council (MLA) (and its forerunner Re:Source) as the strategic body working with, and for museums, archives and libraries.

Fitzgerald and Flanagan [73] describe the implementation of the Unicorn system at the Royal Botanic Garden, Kew for managing its collections of archives as well as books.

Human aspects

One of the core texts related to the human aspects of the use of computers in libraries is that by Morris and Dyer[74]. In the introduction to this work the authors note that there are many pitfalls on the road to the successful implementation of any computer system, such as an LMS, in a library and that if people respond badly to the introduction of the new system, the anticipated effectiveness will not be achieved. They also note that poor workstation and job design can result in poor health and can induce, or increase, stress and that poorly designed user interfaces can result in under-used systems and a decrease in accuracy. The book provides much advice as to how to overcome such challenges and to design systems that are human-friendly.

The role of the systems librarian developed during the 1990s. Following research funded in the early 1990s by the BLR&DD Muirhead[75] reported on the result of a questionnaire aimed at identifying the education, qualifications, previous experience and so on of staff who were involved in the day to day running of LMSs in libraries in the UK and also edited a book[76] containing a series of case studies.

Stress related to technology, or 'technostress', emerged as an identifiable condition during the 1990s. Harper [77] noted that with UK libraries undergoing increasingly rapid technological change at the end of the 1990s this change would have consequences at every level of an organisation, all of which must be managed. He advised that managers need to adopt solutions which range from addressing technical and health issues to being prepared to review job descriptions and roles. Further information on how the implementation of an LMS has effects on job design and staffing structures is provided by Dyer et al.[78] whereas Daniels [79] looks on the effect the implementation of an LMS has had on non-professional staff in three college libraries.

5. Some final thoughts

Inevitably there have been many changes and developments related to the provision and availability of library management systems during the 1990s. Much appeared in the literature on experiences of libraries in choosing and implementing particular LMSs. One aspect that was promised in LMSs and that probably was not used greatly during the 1990s was the management information delivered from LMS. By the end

of the 1990s some LMSs incorporated interfaces to standard tools such as Microsoft's Excel for the presentation of statistical data.

During the 1990s there was an almost total lack of reporting on ways of evaluating LMSs once they had been installed. Given the large amounts of resources, in terms of time and money, invested in procuring LMSs it is perhaps surprising that libraries have not carried out a post-implementation review, although there may well be reasons for this including, for instance:

- no-one requested it
- not enough time
- no money
- no suitable staff to carry out the evaluation
- fear of drawing attention to an LMS's defects soon after large amounts of time, money and collective energy ahs been expended
- lack of a baseline for comparison of improved service.

However, there are many reasons why a post-implementation evaluation of an LMS should take place. Such reasons include to:

- determine if the broader goals of the library are being met by the LMS
- determine if the particular goals of implementing the LMS have been met
- determine if the system as delivered satisfies the contract
- enable others to learn from the experience
- provide an account to the funding body of the money spent on the LMS
- investigate complaints from the staff or users about the system
- establish a benchmark showing at what level of performance the LMS is operating.

Akeroyd [80] concluded his overview of LMSs with a description of some of the functionality required by future systems and which were beginning to be investigated in some research projects at the end of the 1990s. These included:

- the integration of multiple sources and systems, both of bibliographic information and the full-text of documents
- the simplification of access to sources
- the personalisation of systems
- a change in the way that software is created and maintained.

Only a review of the next years would provide an overview of such future developments.

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