

Rethinking professional competence for the networked environment

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Introduction

Advances in information and communication technologies are having a significant impact on library and information services in all sectors of society. Academic Libraries have historically been at the forefront of electronic library developments and the use of information technology (IT) in the sector can be traced back over more than four decades, but there is no room for complacency as the changes currently in train are arguably more profound and more extensive than those experienced in previous eras. This chapter will look at the new electronic environment, the changing roles that it requires and the consequent implications for staff development.

The new electronic environment

In his turn-of-the-century overview of 40 years of libraries and IT in higher education, Cliff Lynch, Director of the USA-based Coalition for Networked Information, identifies three distinct phases of development, showing how the focus and nature of IT-related change in libraries has shifted over time, taking us from the modernization achieved through automation to the innovation and transformation driven by network technologies (Lynch, 2000).

From computerization to networking

In the first period of automation libraries, began to use IT to manage their (print-based) collections by computerizing routine 'housekeeping' operations, thus improving their efficiency. This period also included the introduction of shared catalogue records, which enabled a significant reduction of staff efforts in that area. The second period was characterized by a step-change in user access to library catalogues and bibliographic information with the advent of online public access catalogues and direct end-user access to abstracting and indexing services via standalone and networked CD-ROM products. The latter offered end-users access to systems and facilities that were previously the specialist preserve of staff trained in online searching and signaled a transfer of activity from library staff to users.

The third period represents the real beginning of the electronic library with the arrival of online content, initially in the form of CD-based and web-enabled access to the full text of journal articles, but also including the digitization of historic collections of archives, manuscripts and rare books. the rapid emergence of the world wide web as a

channel for communication of information has complicated the picture with the huge quantity of dynamic information available online within and beyond higher education institutions, raising questions for academic libraries about the boundaries of their responsibilities. Many libraries are extending their remit to include electronic delivery of institutionally generated information such as exam papers and research outputs and as a result are involved in scholarly communication and institutional publishing.

The distinguishing feature of the present era is the network dimension coupled with ubiquitous computing. Academic library users today expect easy, seamless access to information resources and services from anywhere in the world around the clock. Developments in computer-mediated communication have given rise to new concepts such as 'networked learner support' (Fowell and Levy, 1995; Bouchet, 1998) and, more specifically, 'networked reference assistance' and the virtual referenced desk (VRD) movement, where libraries often work collaboratively with global partners (for example, via the *QuestionPoint* service developed by the Library of Congress and OCLC), but are also operating in competition with alternative information providers, notably Google Answers (Bakker, 2002; Kenney et al., 2003). These services use e-mail, web forms, conferencing systems, internet relay chat and other network technologies to provide either asynchronous or synchronous support to library users.

In previous eras libraries were often ahead of other parts of their institutions in electronic delivery, but now they are part of much larger configuration of computer-based facilities and activities supported by local, regional, national and global networks. Library staff therefore now need to co-ordinate and, ideally, to integrate their systems and services with other campus provision to optimize efficiency and effectiveness. Until recently the main concern was to achieve interoperability between library management systems and institutional administrative databases for student records, personnel and finance, but the focus has now shifted to the integration of electronic library provision with systems supporting learning, teaching and research.

The learning information space

The use of IT in teaching and learning has evolved over the past decade from a pattern of uneven activity, largely dependent on individual initiatives of innovators and enthusiasts, to a position of mainstream provision, typically guided by institutional strategies for e-learning emerging as part of their learning and teaching and/or information (technology) strategies, often in the context of internationalization and the development of distance education programmes. The method of deployment has similarly evolved from fragmented application of presentation and communication technologies to their co-ordinated exploitation through integrated course management systems or virtual learning environments (VLEs). While some users, notably medical schools, have developed their in-house learning management systems, most institutions are now purchasing site licences for off-the-shelf commercial products such as WebCT and BlackBoard. In many cases the level of engagement with e-learning across an institution varies significantly among departments even after adoption of a standard platform and this has led to the introduction of targets and incentives to achieve at least a basic online presence for all programmes of study.

In the UK, developments in this area have been given further impetus by programmes sponsored by the Higher Education Funding Councils and the Joint Information Systems Committee (JISC), such as the Computers in Teaching Initiative, the Teaching and Learning Technology Programme, the Exchange for Learning (X4L) Programme and Digital Libraries in the Classroom (the latter, significantly, a joint UK-USA venture, funded in conjunction with the National Science Foundation). In 2003, the Government's White Paper *The Future of Higher Education* promised that the Higher Education Funding Council for England would work with partners to 'embed e-learning in a full and sustainable way within the next ten years' (DfES, 2003a) and a later consultation document, *Towards a Unified e-Learning Strategy*, reinforced that commitment and flagged the need for inter-institutional and cross-sectoral collaboration to smooth links between universities, colleges and schools (DfES, 2003b).

VLEs generally provide facilities for individual and group communication (via e-mail, notice boards, conferences, chat rooms, and so on) as well as administrative and educational information (such as module descriptions, timetables, reading lists, lecture notes, assignments and quizzes). They allow tutors and students to upload documents to the course area and to link in resources from other web sites. Most institutions now recognize the need to interface or integrate their VLEs with their student record systems to create a seamless managed learning environment (MLE) enabling automatic data transfer between the two systems, but the relationship between library management systems and VLEs and the position of libraries in MLEs are less well defined.

MLEs represent both an opportunity and a threat to academic information provision. Many academic libraries already provide electronic information resources through library websites and subject gateways, some also offer e-learning resources and web-based training materials for information skills development. Libraries have also been involved in developing electronic collections of core readings for students, notably via the UK Higher Education Resources On the Net (HERON) service, which clears copyright and digitizes book chapters and journal articles for e-reserve collections. However, with the advent of VLEs, academic staff are also becoming involved in information provision and often not communicating or consulting with library staff over resource selection and description. John MacColl (2001) identifies several problems and potential solutions arising from MLE developments, with reference to the JISC-funded ANGEL project, which aims to develop an Authenticated Networked Guided Environment for Learning. One concern here is the risk of a shift away from institution-wide provision (via the library) to course-restricted access (via the VLE) and another is the need to re-engineer traditional library acquisition and cataloguing procedures by introducing new online tools for the management of digital content.

Library staff need to aim for both service and systems integration in the new networked world and to grapple with complex interactions in the 'learning and information space' in the online environment. Neil McLean (2002) draws on the Australian Government-sponsored Collaborative Online Learning and Information Service (COLIS) project to identify the 'functional chunks' to be integrated, which include systems for library e-services, e-reserve and e-journals; content management; learning content management; learning management; digital rights management and directories services. McLean urges libraries to collaborate closely with other key learning and information stakeholders (academic and technical) in their institutions and to be

prepared for a redefinition of boundaries between library and other domains. Areas where joint working is needed include the metadata infrastructure, rights management, portal developments and access (authentication and authorization) services.

The scholarly knowledge system

In research, IT has had a significant impact on the methods used and the subject matter investigated as well as on the whole scholarly communication system. Libraries have naturally played a part in the evolution of scholarly communication, gradually migrating their periodicals subscriptions from hard copy collections through parallel provision of print and digital resources to increasingly electronic-only access. Electronic provision has the potential to solve many of the problems associated with print journals, such as the difficulties of providing multi-user and multi-site access and the limitations of paper as a medium for representing some types of knowledge. However, while there have been significant gains from electronic publishing, the situation has become much more complex and challenging for both libraries and researchers, with renewable licences replacing outright purchases and other restrictions (such as IP-controlled access, high prices, bundled subscriptions and 'lock-in' agreements).

There have been various initiatives to deal with this situation, collectively referred to as the 'open access movement', which have pursued two complementary strategies of promoting alternative models of scholarly journals offered either at lower prices than commercial competitors or on a different basis (such as pay-to-publish rather than pay-to-access) and encouraging academic authors to deposit ('self-archive') their papers in institution-based or discipline-based open access repositories. Proponents of open archives, such as Stevan Harnad (2001), have promoted the potential role of libraries in helping researchers to archive their work as 'e-prints' and maintaining institutional archives as 'an outgoing refereed collection for external use, in place of the old incoming collection via subscription costs for internal use'. Harnad also argues that library consortia can help journal publishers committed to change, as has been shown by the success of the Scholarly Publishing and Academic Resources Coalition (SPARC) formed by the USA Association of Research Libraries in 1998.

Peter Suber, author of the *Free Online Scholarship Newsletter*, suggests that librarians should deposit their own scholarly output in open access archives such as E-LIS (E-Prints in Library and Information Science) and DLIST (Digital Library of Information Science and Technology) (Suber, 2003). Academic libraries around the world are now actively engaged in setting up and running institutional repositories, with support in the UK provided through the JISC Focus on Access to Institutional Resources (FAIR) Programme. Although standards and tools continue to evolve, most commentators agree that the challenges here are not technical – or even financial – but essentially cultural, with differences between disciplines adding another dimension to the problems faced by library staff trying to populate repositories (Pinfield, 2003; Day, 2003).

Writing on the future of the university in the digital age, James Duderstadt (2000) of the University of Michigan notes that research and scholarship are already dependent on computers, networks and digital libraries – for example, to simulate physical phenomena, to link investigators in virtual laboratories or 'collaboratories' and to provide scholars with access to knowledge resources. IT is not only enabling researchers to

address previously unsolvable problems, it has actually created simulation as a third mode of research alongside theory and experimentation. Similarly, IT has encouraged the shift from solitary scholarship to collaborations of research teams spanning many disciplines, institutions and countries. Duderstadt sees the library of the future as a 'center for knowledge navigation, a facilitator of information retrieval and dissemination' but in a significantly different way, pointing to profound changes that will 'involve the evolution of software agents, collecting organizing, relating, and summarizing knowledge on behalf of their human masters'.

The big IT-related development in research is 'e-science', the term commonly used to represent the increasingly global collaborations of researchers interacting with very large-scale shared resources supported by a sophisticated technology infrastructure, known as 'the Grid'. Such resources include massive distributed data collections and knowledge bases as well as high-performance computing, instrumentation, visualization and networking facilities. The new 'cyberinfrastructure' offers technical capacity and functional comprehensiveness of unprecedented depth and breadth and will transform the conduct of research, not only in science and engineering, but also in social sciences and humanities.

In the UK, the Labour Government has invested £120 million since 2000 through the research councils and the Department of Trade and Industry (DTI) to develop national e-science capacity. The DTI envisages the Grid as 'a flexible, secure and co-ordinated resource-sharing infrastructure, based on dynamic collections of computational capacity, data storage facilities, instruments and wide area networks which are as easy to access as electricity in the home' (DTI, n.d.). In the USA, the National Science Foundation has similarly set out its vision for an ambitious research programme, estimated to require \$1 billion per year, emphasizing the potential for working across traditional boundaries, by enabling 'the federation of the necessary multidisciplinary, multi-institutional, and geographically dispersed human expertise, archival data, and computational models' (National Science Foundation, 2003). The UK Research Councils have also emphasized interdisciplinary work in this context.

The generation of enormous volumes of data by e-science experiments will move us beyond theory, experiment and '*in silico* simulation' to a new generation of collection-based research involving the systematic mining of very large datasets, where metadata standards, data federation, cross-collection tools and fusion services will be required. Tony Hey and Anne Trefethen, Director and Deputy Director of the UK e-Science Core Programme, argue the case for creating new types of digital libraries for scientific data with the same sorts of management services as digital libraries for conventional literature in addition to other data-specific services. Such services will thus not only include facilities for data manipulation, management, discovery and presentation, but will also provide tools for data curation, transformation, visualization and mining (Hey and Trefethen, 2002).

Hey and Trefethen also envisage a convergence of scientific data archives and text archives, whereby scientific papers routinely have active links to original data, other papers and electronic theses, so that researchers have seamless access to information and processing on demand from their bench, desktop or in the field. They see this as 'a large issue with profound implications for university libraries'. Technical interoperability of data archives and text repositories will therefore become an important concern for

libraries alongside the interworking of library services and learning resources identified above. Hay and Trefethen see libraries as obvious organizations to take responsibility for hosting and curating (digitally) all the research papers produced by universities, but they leave open the question of responsibility for hosting and curating the scientific data produced by researchers, although they are clear that data curation and longer-term preservation require collaboration between all parts of the community, including scientists, librarians and IT specialists. Potential synergies between libraries and e-science are also flagged in the final report of the Research Support Libraries Group (2003) established by the UK funding councils.

A key point here is that while it is possible conceptually to separate research/e-science and learning/teaching and to identify distinct workflows for these academic processes, both sets of activities are ultimately dependent on the same original sources of data and information, which are continuously used, reused and repurposed to advance knowledge and understanding. Liz Lyon, Director of the UK Office for Library and Information Networking (UKOLN), uses the concept of a 'scholarly knowledge cycle' to elaborate these relationships and explains how the eBank UK project aims to improve the transparency of scholarly processes by addressing issues such as the provenance of digital resources and hierarchies of data and metadata (Lyon, 2003).

Strategic alliances and partnerships

As already indicated, another defining characteristic of the current environment is collaborative working, both within and beyond the institution. Electronic information provision has required much closer collaboration between academic libraries and their computing and IT counterparts, and in many institutions has resulted in the unification of all information-related services into a large 'converged' information organization. Operational convergence through the physical collocation of library and other services to create 'one stop shops' for users is even more common than structural convergence, and it is generally the library building that is chosen to host an increasingly diverse range of resources and facilities, such as workstation clusters, training rooms, IT helpdesks, study skills centres, video-conferencing suites and internet or learning cafés.

Libraries have a long history of inter-institutional collaboration, particularly for the electronic exchange and use of bibliographic data, evidenced by the development of publicly accessible union catalogues, such as COPAC (the online catalogue of the UK Consortium of University Research Libraries). However, technologies now available offer the opportunity for much deeper resource-sharing in a federated digital library enabling innovative local recombination, reshaping and reuse of collaboratively built, jointly owned, centrally pooled content (Seaman, 2003).

Another significant development is the shift towards library collaboration being institutionally determined (rather than library-led) with partnerships arising from strategic alliances formed at institutional level, including membership of regional, national and global university consortia, such as UK eUniversities Worldwide (UkeU), Universitas 21 and the Worldwide Universities Network (WUN).

Changing academic library roles

In the initial period of library automation the roles most affected were those of the clerical staff, typically library assistants, involved in handling book and borrower records for acquisition, cataloguing and circulation activities. The tasks of sorting, filing, counting and collating slips and forms were removed by computerization, and staff who took pride in their competence in carrying out such duties found their skills becoming redundant and their time being redistributed to areas where manual effort or a physical presence was still required (such as shelving books or staffing the counter). The introduction of shared or derived bibliographic data began to alter and routinize a lot of cataloguing work, which raised questions about the level of knowledge and skills needed to do the job. Meanwhile, the development of computer-based abstracting and indexing services created a new area of expertise in online database searching and many academic libraries established new specialist roles to exploit these facilities.

The Fielden report on human resource management in UK academic libraries (John Fielden Consultancy, 1993) identified three groups of library staff whose roles were set to change most in the new universally networked environment – library assistants, subject or information librarians and senior managers. Fielden noted that paraprofessional and clerical staff were increasingly taking over cataloguing, classification and enquiry work from professionally qualified librarians and forecast this trend would continue to enable subject librarians to develop their role in academic support, while enhanced technological understanding, managerial skills and political acumen would be needed for the management of libraries, particularly for senior positions.

The emergence of paraprofessionals

Writing from a US perspective, Larry Oberg (1995) explains how automation of library processes and other factors resulted in a redistribution of workload with the creation of new tasks, realignment of old ones and – most significantly – emergence of a new category of staff, the paraprofessionals who ‘administer major functional areas of our libraries, are assigned reference and information desk duties, perform a variety of systems work, and catalog most of the books added to our collections’. Thus paraprofessionals or ‘support staff’ now dominate functions such as acquisitions, cataloguing, document delivery and interlibrary loans, and in many libraries they have also assumed primary responsibility for basic reference services. Oberg envisages that eventually they will be given primary responsibility for the day-to-day running of academic libraries, but he also flags unresolved issues relating to pay, status and continuing education opportunities for this group of staff, whose success in their new roles will depend on fairer treatment and proper socialization into the professional values promulgated by librarians.

Mark Sandler (1996) similarly points to more diverse and higher level roles for library assistants in research libraries, resulting in blurred boundaries and functional overlap. His examples include reference work, systems development and maintenance, acquisitions and cataloguing (where the role of assistants has extended from downloading and upgrading bibliographic records to original cataloguing and subject analysis). Sandler also argues that advances in technology have created a new class

divide among library workers leading to an 'ascendant class' of IT-savvy librarians and paraprofessionals while librarians possessing only supposedly simpler 'traditional' skills have suffered a loss of status. He predicts continuing transformation of the roles of professional and paraprofessional staff and a corresponding decline in the numbers of professionally qualified staff employed. Likewise, the Consortium for Educational Technology in University Systems (CETUS, 1997) formed by the California State University and the City and State Universities of New York, envisages that paraprofessionals will increasingly assume supervisory and budgeting responsibility for units such as circulation, short loan or reserves and interlibrary loans.

The academic liaison librarian

The CETUS discussion paper sees librarians as 'indispensable counselors in the electronic environment', working as advisers and teachers (rather than custodians of collections) and working with faculty and students in their own spaces (instead of only in the library building). Its key message is that the role of librarians is growing closer to that of teachers, becoming increasingly discipline-based and instructional or educational, including the following core activities:

- partnering with discipline faculty and other specialists for delivery of information and instruction
- designing instructional programmes for information access
- teaching students and faculty how to access information, whatever its format or location, and how to evaluate what they find
- serving as consultants on information resources, issues and problems
- developing and implementing information policy
- creating information access tools
- selecting, organizing and preserving information in all formats
- serving as leaders and facilitators in introducing information technologies and ensuring their effective use (CETUS, 1997, 5-6).

The bulk of this work will typically be the responsibility of staff variously described as 'subject', 'reference', 'liaison', 'information' or 'field' librarians. The term 'liaison librarian' or 'academic liaison librarian' has been chosen by many institutions to flag a shift in focus from looking after collections in a designated subject area to liaising with users from a named academic unit. Stephen Pinfield (2001) examines how this role has changed and developed in the electronic environment, drawing attention to increased emphasis on liaising ('connecting') with users and teaching information skills, on new approaches to (digital) reference and enquiry work and producing (web) subject guides, and on involvement with educational technology and project work.

Pinfield also stresses the importance of teamwork in this role, including working with library and computing colleagues. Kelsey Libner (2002) similarly emphasizes the need to collaborate with other players to create a seamless information environment, suggesting a range of potential partners, such as information architects, instructional technologists, interface designers and computer scientists, as well as teachers and administrators. Libner envisages librarians 'using technology to guide online users to relevant

databases, books, journals, and web sites...they will reduce the staggering complexity of a hybrid environment by presenting users with clear and useful choices among a few relevant options, regardless of their discipline, level of research experience, or means of access to the library'. Richard Biddiscombe (2002) sets out a bolder view of the subject librarian of the future, arguing that as 'learning support professionals' they have many of the skills needed to take on much of the generic tutorial and pastoral support currently provided by academic staff, which will have to be managed more efficiently with expected continuing pressure on resources.

The changing role of subject or liaison librarians shows how work in 'boundary-spanning' areas has become more complex as a result of technological developments. Collection development raises questions about including free resources (such as open-access journals) in OPACs or web pages and creating virtual collections by harvesting metadata from distributed repositories. User education has become more demanding with the multiple formats, huge volume and dubious quality of information available; expansion and diversification of the student population, with more mature, part-time, postgraduate, research and international students; integration of information skills with teaching, research and enterprise programmes; and high level concerns about copyright and plagiarism. Provision typically covers topics such as accessing electronic databases and journals; finding high quality resources on the web; keeping up to date with new information; using bibliographic software packages; carrying out citation and advanced database searches; and searching for systematic reviews. Delivery is usually tailored to the discipline, experience and priorities of students and staff and can take many forms, such as group sessions, individual support, self-paced learning packages (via the web or VLE) and team teaching with academic colleagues.

Strategic management of technology

The IT revolution has not only altered and developed established roles, it has also given rise to new specialisms and posts combining expertise in 'content' and 'conduit'. In many academic libraries, the traditional job of 'systems librarians', which was often located with bibliographical or technical services, has now evolved into a strategic role at senior management level, typically heading a team of specialists responsible for library systems, multimedia resources and web-related developments (Lavagnino, 1997). Titles such as head of systems or head of e-strategy are commonplace. New specialist posts are frequently offered as fixed-term appointments on the assumption that emerging areas require a focus of expertise initially until new practices become embedded. Examples include posts such as e-journals co-ordinator, metadata manager and online course librarian. Other new technical roles have emerged with externally funded digitization projects. The development of digital collections is also forcing librarians to rethink the cataloguing function to guard against establishing separate departments (and practices) for the description of manuscript, print and digital resources. The whole area of 'knowledge organization systems' is critical to the successful management and exploitation of the latter (Hodge, 2000).

Implications for staff development

It is widely acknowledged that the academic library world is changing faster than it has ever done before and that the pace of change will continue to accelerate, with advances in information and communications technology being the key driver. Changes in the operating environment are being reflected in changes to staff roles, which in turn require the profession to rethink the skills, knowledge, understanding and motivation needed to design, develop and deliver a high quality professional service. Many organizations and individuals have investigated and commented on the skills needs of the library and information services workforce for the present and the future, with several large-scale studies being commissioned by the UK information services National Training Organisation (ISNTO, 2003, 2001; Skelton and Abell, 2001) and an in-depth study of senior management needs in academic information services funded by the Higher Education Funding Council for England (Dalton and Nankivell, 2002).

While these various studies differed in their purposes and scope, a common theme in all the reports is the increasing breadth and depth of the skillset (in its broadest sense) needed by library and information workers in the new electronic environment. Information-related skills are only part of a much larger picture of sector skills needs. The report by Val Skelton and Angela Abell (2001) on strategic information skills for the information services workforce in the knowledge economy usefully grouped the required knowledge, skills and attributes into three broad categories, which in turn can each be subdivided into two sub-categories as follows:

- professional and technical knowledge and skills
 - information (content) management competences
 - information technology (conduit) management competences
- business and management knowledge and skills
 - organizational (context-specific) competences
 - transferable (generic) competences
- individual and people skills and attributes
 - interpersonal (relationship) competences
 - personal (effectiveness) competences.

All the reports commented on the importance of IT skills and understanding for the information profession, but they all also ranked management and (inter)personal competences as the most critical and pressing development needs for the sector. In the current rapidly changing environment, academic library managers similarly must constantly pay attention to IT-related development needs, including needs arising from the impact of IT on information and content management, such as the introduction of new knowledge organization systems (metadata, ontologies, semantic networks, and so on) for digital resources. As in other sectors, 'business' (academic, education or research) knowledge, skills and understanding are essential to effective library performance and must be complemented by generic management and people competences for all staff.

Information and communication technologies

Most library collections will continue to combine traditional and digital resources for the foreseeable future, but library operations are already largely electronically based, both on the front line and in office and other work areas, with e-mail, local intranets and shared file stores underpinning much of the daily communication between staff. All library workers need to have at least the basic IT skills that enable them to use e-mail and the web. Manual, portering, reception and security staff must be included here to ensure that they are not cut off from communication channels. In addition, many libraries are broadening the roles of such staff to cover basic support for users, such as information about service availability and assistance with self-issue transactions. Library assistants, paraprofessionals, technical teams, liaison librarians and others will all have particular IT-related knowledge and skills needs according to their roles, covering areas such as library, digital object and learning management systems. Staff providing access to e-journals need to be able to install and maintain all the plug-ins and add-ons now required to access primary and supplementary journal content. Diana Kichuk (2003) identifies eight different file formats for the former and many more for the latter. Staff involved in creating digital collections also need specialist knowledge and skills in areas such as mark-up languages and digital imaging (Hastings and Tennant, 1996).

However, there is a need to think beyond immediate job-related knowledge and skills needs. Technology is advancing so rapidly that what is learnt today will soon be superseded, so the requirement is really about developing the ability and willingness to learn new tools and techniques continually, rather than developing specific technical expertise. All library managers have a key role to play here in raising awareness among the whole library workforce about IT trends and issues in order to build understanding of the technical context for service and staff development. It is particularly important for senior managers to act as role models in developing their own understanding of the technical capacities of digital technologies and keeping their own knowledge up to date, especially in relation to local and global developments in e-learning and e-science.

Academic integration and collaboration

The network is both the medium and the message of the new electronic environment. Learners, teachers and researchers want academic information services that are accessible and coherent, joined up with each other and to their own systems in a seamless whole. Library staff need to integrate their resources and services into management environments for learning and research and they need to collaborate with others to achieve this goal. The key players here on the library side are the liaison librarians and senior managers who need to have the (human) networking, teamworking and other interpersonal skills to build collaborative relationships and work across academic and service boundaries. More critically, library staff need the capacity to relate, contextualize and extend their professional competence to fit the aims, programmes and cultures of all their partners. Patricia Battin (1998-2001) sees this ability as fundamental to our professional future: 'The one absolute and integrating requirement is to develop sufficient knowledge and understanding of each area of expertise outside of one's own in order to communicate and work productively with

specialties other than one's own.' Computing or IT services are the most frequently mentioned service partners for libraries, but careers advisers are another group whose work needs to be co-ordinated with that of liaison librarians so that they can collaborate on embedding key skills development in the curriculum. Other partners for libraries include service departments and academic units at other institutions – often overseas – with whom their own institution has an alliance.

Battin also believes that in the new electronic environment there is a greater need for academic librarians to have in-depth knowledge of disciplinary specializations. This includes knowing what the discipline's primary questions are, how practitioners seek and use information, how the literature is structured and how patterns and methods of research and teaching are changing, especially in relation to use of digital technology. Pinfield (2001) confirms the advantage of librarians having a background in the subjects for which they are responsible, but accepts that a relevant first degree is not always essential, the crucial requirement being an appreciation of teaching and research techniques in the subjects, of the structure of the literature and of the key terminology and concepts. Many commentators stress the growing importance of teaching or instructional skills for subject and liaison librarians. Battin links the need for an 'ability to design and teach creative educational programs' with the advent of networks, the wide range of electronic resources and constantly changing literature structures. Biddiscombe (2002) goes further in arguing for 'a real and proven understanding of the learning process', evidenced by a formal pedagogic qualification (such as membership of the Institute for Learning and Teaching in Higher Education and/or completion of a recognized course in teaching and learning support). For both liaison librarians and library management, a broad and deep understanding of policy and strategy developments not only within their own institutions but also in the wider regional, national and international arenas is also essential for effective performance.

Managerial and personal competences

As Battin (1998-2001) reminds us, 'Librarianship at every level involves management of something – people, budgets, collections, projects, time, etc.; even...your boss!' and it has always done so. However, the new electronic environment, with its increased complexity and volatility has introduced new management demands and involved more library staff in meeting these challenges. Paraprofessionals (as well as professionally qualified staff) often now need to develop competence in areas such as budgeting and recruitment and need to have the confidence to contribute to policy and planning (CETUS, 1997). Many digital library developments are financed through external project funding and this has put a premium not only on project management skills, but also on abilities in drafting project proposals, preparing grant applications and managing fund-raising activities (ISNTO, 2003, 2001).

Library staff in the networked world also need a wider set of personal skills and attributes to operate effectively. Examples include negotiating skills, to agree licensing terms and access rights for electronic resources; evaluation skills, to select high quality resources from the huge quantity available; and problem-solving skills, to respond quickly and flexibly to new and unexpected situations. The ISNTO (2003) Skills Foresight report notes a significant mismatch between the high priority given to problem-

solving by employers and the low value assigned by practitioners. Battin actually puts such 'proficiencies' on a par with traditional skills: 'The abilities to learn quickly, to flourish in an ambiguous environment, and to design and execute creative solutions to new situations will be just as important as proficiency in the more traditional skills of cataloging, reference, and bibliography.'

Conclusion: rethinking staff development strategies

The success of the library of the future will be dependent on computer and human networks and the effective interworking of systems and people. Library staff roles are continually evolving and new information specialisms are arising frequently, often at the boundaries of existing professional groups. Academic library managers will need to deal with strategic issues surrounding the library's contribution to MLEs, institutional scholarly output, the management of scientific datasets and other concerns not yet identified.

Library staff development must evolve to meet these challenges. New competence frameworks are required to reflect the wider skills set, broader knowledge and deeper understanding needed at all levels, particularly in relation to IT, e-learning and e-science developments. Success will also depend on the possession of appropriate 'meta-competences' such as communication, self-development, creativity, analysis and problem-solving (Cheetham and Chivers, 1996). Staff development methods will similarly need to evolve to fit the new paradigm, with more emphasis on one-the-job and in-role approaches, including challenging assignments, project secondments, cross-functional teamwork and mentoring relationships. Liaison librarians and senior managers will benefit from engaging in action learning and research and other development activities alongside academic colleagues.

Academic library staff development planning and programming will therefore need to be managed strategically in collaboration with academic and service partners to match the new networked environment.

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