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## The Integrated Librarian: IT in the Systems Office

This article intends to discuss Information Technology diploma programs as an alternate means of educating systems librarians and preparing them for the new challenges faced by library systems offices. The first section outlines my own experience marrying an MLIS with a Graduate Diploma in Information Technology as a means of moving into systems librarianship. The second discusses the application of IT skills to library services in areas like interface design, service development, automation, networking and database development. Finally I will discuss the benefits of cultivating librarians with IT knowledge, rather than relying on non-librarians to perform technical work in the library.

### The Allure of Systems Librarianship

When I received my Master's in Library and Information Studies (MLIS) from McGill University in 1997, I hadn't considered systems librarianship as a possible career path. In graduate school we had explored the usual options of cataloguing, collections, archives and reference services. Although I was aware that the work of all of these positions was supported and facilitated by an Integrated Library System (ILS), somehow the fact that the system itself was supported and maintained by a group of librarians escaped me entirely.

When I started my first job, as a reference librarian at Marianopolis College in Montreal, I was unprepared for the extent to which my job depended on technology, and the extent to which the technology depended on me. I spent almost all of my time in front of a computer, even during instruction and public service. The library was effectively crippled if the network was unavailable, or the catalogue was down. During the course of my MLIS I had done some coursework in database design, electronic searching, and html. As one of only two librarians in a small college library, I was suddenly involved in setting up a network server, establishing a LAN, implementing a library web server, purchasing and installing computer assisted learning software, designing a website, and selecting a new ILS. Part of my job too, was helping staff and students use all of these tools effectively through formal instruction sessions, and during my time on the reference desk.

As we introduced more automation, it became obvious that relying on external support staff for minor troubleshooting issues would impede our ability to provide efficient service. Restarting a web server may simply be a matter of double clicking an icon, but can result in a long service interruption when librarians must contact outside support

people to solve the problem. If on-line reserve material is unavailable for several hours the night before a big exam the service outage can result in angry students, and a loss of credibility for the library. Clients will be frustrated if they cannot print their results after spending two hours finding articles. Students who come to school on the weekend to use a specific networked CD-ROM database expect it to be available. These little day to day frustrations with technology necessitated hands on intervention and self-directed learning. Eventually I began to develop a reputation as a minor “techy”, and became a resource person for technical issues outside of my specific job in the library. This was a revelation to me. Most of our users were moderately impressed that I could track down an obscure article, but immensely impressed if I could open a document they really needed, or design a system to post class notes on the web. I began to recognize how valuable these skills were to both the library, and the college, and in 1998 they were still fairly rare among my colleagues. At the same time I was increasingly aware of my own limitations in the area of technology, and looking for a way to improve my knowledge.

### Assessing the Alternatives for Educating Systems Librarians

While at Marianopolis I had access to a small budget for professional development, which I used to attend training seminars on topics like server side operating systems, network administration and advanced database design. The courses were useful but it was often difficult to find the time to practice new skills in the workplace. With money and time available to attend only one or two sessions each year it was a struggle just to stay current, let alone improve my knowledge base substantially. Practicing administration skills on our production ILS was verboten, as mistakes could mean data loss, down time, and other system issues too terrifying to contemplate. Training programs specific to libraries and library systems were pretty much non-existent, even in a big center like Montreal with a number of major academic libraries, and several programs for librarians and library technicians.

At this time I attended the emerging technologies seminar at the Ontario Library Association annual conference. There I saw real Systems Librarians speak about projects they were undertaking ranging from Public Workstation Security to developing XML applications for information sharing. This was an exciting aspect of libraries and it gave me a glimpse into a career path that I had not heretofore considered. Upon my return to Montreal I began to scour listservs for systems librarian postings. High demand skills included Networking protocols (TCP/IP, HTTP, telnet, ftp and Z39.50), UNIX & Windows/NT Operating Systems, Hardware Troubleshooting, Database design and administration, Web design and development, and Programming in SQL, PERL, C/C++. This was discouraging. Library school, certainly as I knew it in 1996, offered nothing along the lines of programming or systems administration. A rudimentary amount of database design was offered, and we were given some training in basic html. There were no courses called “Inside the ILS”, “Grep your way to User Satisfaction”, or “Get Dynamic with PHP”. How had those other librarians, with the same degree as I, managed to assimilate all this seemingly obscure knowledge?

Part of the answer was clear in the advertisements. Almost all of them required three to five years of experience with Library Systems. I deduced that a number of systems

librarians probably developed along with nascent library systems, and increased their knowledge base as the systems demanded more complicated on-site intervention. This was not reassuring, everyone wanted systems librarians with experience, but no one wanted to hire newbies and train them into the position. Some of the postings asked specifically for a BCS or MCS combined with an MLS/MLIS. Although I had enjoyed my previous six years of university, the idea of returning for another four years to get a Computer Science degree was daunting, especially coupled with a return to impoverished studenthood, and mounting loans. I had chosen Library Studies specifically because it seemed like an employable option after my undergraduate degree in history. Fortunately my career soul-searching corresponded, in 1999, with an growing trend for institutions to offer shorter Diploma programs in Information Technology aimed at graduates. Although I was not taken with sunny promises of immense wealth and total job security, many of these programs claimed to offer the skills that employers were seeking in systems librarians.

### The IT Experience

Choosing an IT program took time and research. I knew that I was willing to relocate so I looked at various programs across Canada. Programs vary in length from one to three years, they are taught in colleges, universities, and private institutes. Some offer a generalized introduction to many topics, others offer streaming and specialization. Many offer options for professional certification, sometimes at added expense. Prices vary enormously also. In Canada a one year program can cost anywhere between \$12,000 and \$24,000, but paid work terms may be offered to help offset costs. The curricula can differ greatly, but I was looking for four critical areas; programming for UNIX, Windows and Web environments, Database design and administration, Networking protocols/Network administration, and Microcomputer hardware/software configuration. I eliminated programs that focused primarily on Microsoft certification, those that didn't have a strong programming element, and those that concentrated on producing corporate specialists. As a background for systems work I preferred a program that would offer an introduction to many areas of technology, providing a base that could be built on at work to suit changing demands. Technology graduates expect to be life-long learners, and self-directed learning is essential once back in the workforce or skills quickly become obsolete. Eventually I chose a one year university program – Memorial University's Graduate Diploma in Information technology. A university environment offered several benefits, including the opportunity to find a work term in an academic library. The program offered a one year generalized curriculum that included my identified topics, with opportunities to certify in Cisco Networking (CCNA), and Oracle Database Administration. Memorial also had the lowest IT tuition rate in the country and offered a paid work term, no small consideration when leaving a full time job and augmenting existing student loans.

The Graduate Diploma in IT program was a very positive experience. My master's degree, and work experience provided an advantage over students who were entering directly out of their undergraduate programs because they offered insight into how the skills might be applied to real work situations. I considered IT from the perspective of library work, and how it could be applied to improve services and systems. My

understanding of myself as a library professional helped provide context and motivation for learning. The program itself was extremely intense, covering many topics quickly. It required a major time commitment. Students often spent twelve hour days at school, and came in most weekends. Topics were taught in blocks, concentrating on one subject for a week or two full-time, and then moving on to something new. Later courses built on skills learned in earlier courses so it was important to stay on top of things from the very beginning. Most students found programming to be the most intimidating area, and those courses tended to have the highest failure rates.

The systems office in Memorial's Queen Elizabeth II Library agreed to hire me on a part time basis during my second semester of IT I was subsequently accepted for a work term, which turned into a contract, and eventually a full time position as Manager of Information Technology Services. The QEII library supports the teaching and research interests of Memorial University's 16,000 graduate and undergraduate students and 900 faculty members. The library is the largest in the Atlantic provinces, and is also heavily used by the general public and non-Memorial researchers. During my first year at the QEII I have been required to apply a wide range of knowledge, drawing heavily upon the skills acquired during my IT education. All things technological fall under the umbrella of systems, and our mandate is expanding constantly to accommodate new expectations and demands.

#### Information Technology and the ILS

The biggest challenge coming out of an IT background, rather than having developed my technical skills in a library environment is understanding the ILS. As is the case in most large academic libraries, the library systems office at Memorial has primary responsibility for administering the ILS (Integrated Library System), Sirsi's Unicorn. This includes managing accounts, reports, policy development, backups, system upgrades, AIX administration and configuration, and maintenance of the UNIX production and test servers. Additionally we are responsible for installing configuring upgrading and troubleshooting the client software and web based OPAC, and providing staff access and permissions to various modules. These are traditionally the duties of systems librarians and they require a great deal of expertise. My experience is divergent from that of systems librarians who developed their skills a decade ago. Many systems librarians came to technology through the ILS. At that time the ILS was the center of the universe as far as library technology was concerned. The old school Integrated Library Systems were largely created as self contained environments, with little opportunity for in-house customization. They used proprietary query languages and compiled code. The authentication systems and interfaces were not designed to integrate easily with other with other resources, including the larger library web site.

Web based service delivery is changing the role of the library systems office substantially. Traditionally the catalogue has been used as the primary means of providing access to library resources. Because of the difficulty integrating the OPAC with other parts of the library web site, Memorial Libraries had developed several other resources on their web sites to help users access databases and electronic journals. These essentially consisted of html pages with lists of links to resources, or an explanation of

how to access them through the catalogue. This approach was cumbersome, because it involved entering and updating data in the catalogue and on the website, each the responsibility of a different division. It was difficult to keep information up to date and consistent. We wanted to find a way to refresh the data on those pages automatically when the cataloguing record changed. Unfortunately our ILS does not support SQL, the obvious choice for extracting information from a database and outputting it in different formats. The solution required porting the data out of the catalogue into MS SQL server, and writing a dynamic interface to format and deliver this information over the web. Several layers of development were involved using programming in Perl, SQL, and ASP as well as database, ODBC and interface design, and web server configuration. Programming is essential for developing new web based services, for reformatting and porting data from legacy systems, for automating daily tasks, creating reports and statistical profiles, and for integrating existing systems running across different platforms. Next generation library systems are already moving towards SQL back end databases like Oracle, and XML interfaces to allow the integration of multiple metadata standards. These systems will bring a different approach to the catalogue, with many more possibilities for flexibility, customization and integration. Systems librarians will require a broad IT skill set in order to develop services that take advantage of these benefits.

Having a grounding in UNIX, database design and programming makes it easier to navigate the intricacies of the ILS, but much of the administration work is well outside the realm of anything taught during my post graduate studies. The QEII Systems office has a commitment to training its staff, and I was fortunate enough to be able to attend Unicorn Administration Training courses at Sirsi headquarters in Alabama. This was certainly helpful, but a one week course can only scratch the surface of ILS administration. In order to develop a new generation of systems librarians, it is important that accredited Library schools offer courses intended to introduce students to the inner workings of Integrated Library Systems. At the moment, in Canada, there are few options but to rely training from the system vendor, who is likely not situated in the same city, province, or perhaps even country. While library schools cannot concentrate on teaching technology to the exclusion of more traditional areas, it is reasonable to expect they assume the task of introducing librarians to the system upon which much of their work will depend. The current approach in which employers pay vendors to provide training on proprietary systems makes it difficult for graduates trying to break into systems librarianship. Libraries want to hire systems librarians with existing ILS administration skills, but the only way to acquire those skills is by training provided through the employer.

### The Systems Office beyond the ILS

The Integrated Library System is, however, only one of several critical services managed by our systems office. This evolution challenges the concept of systems librarian as simply ILS experts. The explosion of library technology has expanded the duties of the Systems office well beyond improving the delivery of bibliographic information. At Memorial we are charged with many other responsibilities for which IT skills like networking, programming, database design, and hardware/software configuration and troubleshooting have been absolutely invaluable.

The systems office provides network support services and is mandated to administer the QEII's local area network. This involves administering, maintaining, configuring and upgrading four network servers. This year alone we have set up and configured a new library web server, a staff web server, two proxy servers, several ftp servers, and a centralized print server running Pharos Uniprint software. We migrated our network servers from Windows NT to Windows 2000 and retooled all user groups and permissions on the network. We expanded the library IP range by 1500 addresses and reorganized it to group divisions and users in a logical manner which facilitates the use of IP access lists for authenticating against restricted resources.

Our systems office is also responsible for purchasing, tracking, installing and supporting all microcomputer hardware and software within the library. At MUN's QEII this means supporting over 250 workstations running several operating systems and hundreds of different software applications ranging from widely used packages like MS Office suites, to library specific software like Papyrus.

Many of our electronic indexes used to be mouted locally as CD-ROMS or loaded into BRS to be searched through the catalogue. These tasks were always performed by system staff, but slowly phased out as we moved towards remote web-based services. The legacy of "database" responsibility is that we act as technical liasions with publishers of electronic content like e-book, e-journals and electronic indexes. The systems office is also responsible for ensuring that our local networks and systems interface properly with The responsibility of the systems office for all things technological in the library is almost unmanageably broad now that technology has permeated every aspect of library work. Our reliance on remote content providers broadens this further to include responsibility for access to remote systems, over which we have little or no control.

The QEII systems office also hosts the Relais Interlibrary Loan System for the East Coast Relais Consortium (ECRC) and it's six member universities. Relais is a suite of windows applications that run across several NT servers and uses an Oracle back-end database for tracking requests through every stage of the lending process. The system uses extensive networking including FTP, TCP/IP, Netbios, Z39.50, and we are in the processing of implementing remote access through VPN. As early adopters of this technology Memorial has been intimately involved in beta testing new versions as well as maintaining the production system, and providing server and client side troubleshooting for all locations. Many library systems offices are acquiring responsibility for centralized systems that serve multiple institutions. Theses systems often have to interact with other remote systems, like the local library catalogue.

Many systems offices are required to provide support for multi-platform, multi-user, multi-site systems with diverse standards, protocols and programming languages. The challenge is integrating all of these systems in as transparent and efficient way as possible. This integration must also happen between the systems of different institutions to facilitate remote access, document delivery, resource sharing, and consortium partnerships. A great deal of technical knowledge and administrative collaboration will

be required for libraries to actualize the vision of seamless, shared, web-based information systems.

### IT Solutions on a Tight Budget

The expense of implementing new technologies can be a serious drain on library budgets, but technical people can use existing or free resources to improve service delivery. Open source and freeware alternatives to commercial software packages are widely available for most platforms, including Windows. Apache Web Server, War FTP server, Active State Perl, PHP and MY SQL can be installed on a basic Windows 98 workstation to create an accessible and flexible system for sharing information within an institution. The QEII systems office has implemented several projects this year that bridged service gaps by exploiting free software and existing hardware.

Controlling the use of public internet workstations is an ongoing concern at the QEII. The library was originally using hosts files to limit access to only those URLs that were indicated in the library catalogue. This was frustrating to users because the number of sites available was very limited, and many legitimate research sites were inaccessible. It was also cumbersome for staff who had to constantly alter the hosts files, and copy them to each station. To solve these problems we installed an internal proxy server on an existing UNIX box, using free Apache software. This allowed us to open up public workstations for Internet research, while blocking the use of e-mail, chat, messaging, games and various other sites considered an inappropriate use of public research stations. The blocking list can now be updated quickly in one central location and takes effect immediately on every public station. The solution cost nothing, and improved the service from the perspective of both staff and patrons.

Centralized printing services were implemented at the QEII last year using Pharos Uniprint, and the library moved to a charging model for print services. The implementation of paid printing led to accessibility concerns and the systems office was asked to provide an alternative way of delivering files, to enable users to print their results at a location outside of the library. We decided to offer downloading to a shared network drive, with write-only permission. We installed free War FTP software on our existing print server to make the network drive publicly available for read-only downloading. Users in the library can now save their files to a location which can be accessed through the Internet and printed at home, or in a computer lab. Solutions like this are relatively cheap and easy to implement, but they can have a large impact on user satisfaction.

The library systems office can also facilitate information sharing and efficiency within the organization without purchasing additional equipment or software. At the QEII we developed an on-line system for tracking hardware inventory using an Access database on a staff workstation using a free Apache web server, OBDC, and a web interface written with PHP & SQL. This allows us to track hardware components, specifications, purchase dates, usernames, IP's, and warranty information amongst other things. Records can be searched, updated or created from any web browser. The entire system was designed using free or existing resources, and the only real outlay was the time it took to

design and program the site. Another project designed to serve internal users involved the implementation of a free web & ftp server software on a windows workstation. This is available to support professional activities, information sharing and remote file access for all staff and librarians. Technology does not have to come at crippling expense to libraries. With the investment of a little time and expertise cheap, elegant solutions can be developed to answer system needs.

It has been a busy year in the systems office, and my work has required the use of almost everything learned during my IT diploma program, as well a lot of hands on learning. It would have taken me many years to acquire all of these skills on the job, and the work of the systems office is already so diverse and complicated that libraries simply cannot afford to hire and train staff with no technical background. As systems become more complex and user expectations more sophisticated, systems librarians will require extensive technical expertise to meet new demands.

### Librarianship in the Systems Office

While IT skills are a necessity in the library systems office there are also many aspects of Systems Librarian work that require the application of the skills and knowledge of traditional librarianship. Libraries benefit from hiring library professionals to administer their technology. Relying on IT workers who may have a limited perspective on the work flow, culture, and users of academic libraries has several drawbacks. Library administrators and professionals often bemoan the fact that technology professionals do not properly understand the purpose of technology as a tool to serve users. Technology is not implemented as an end in itself, but as a means of improving the work experience of staff and end users. Librarians with a strong grounding in IT can apply the skills learned in traditional public service to serving both external and internal clients. This includes analysing and predicting user needs, choosing tools that are appropriate for the comfort level of the audience, and providing support and instruction on the use of new technologies.

Most libraries have a collaborative and consensus oriented work culture that focuses on participatory decision making and service delivery. Participating in committee work is an extremely important means of staying in touch with emerging projects and trends, and maintaining a sense of user expectations and frustrations. This is especially necessary for systems staff, who often work in isolation from other departments, tucked away somewhere in the library basement. All new projects must start with an analysis of user needs and the articulation of formal, planned objectives. During the development phase it is critical to request ongoing feedback from stakeholders. User participation in the development process generates a broader sense of ownership which ultimately provides improved support for the final product. Involved users also show a much greater willingness to accept and tackle obstacles and problems as they arise, which inevitably they will.

Librarians with a strong IT background also provide an important function as an information conduit between their professional colleagues, and other technical service providers. The ability to talk to a vendor in their language, and translate this information



to librarians helps provide a buffer between the two different cultures and skill sets, lessening the frustrations that can arise from these disparities. Systems librarians often act as a liaison between the library and the main computing department. Most academic libraries rely on their campus computing departments for critical services like network access. It is extremely important to foster goodwill, cooperation, and a strong understanding of the sometimes divergent objectives of both sides. For example, librarians may find it frustrating to have certain attachments and protocols blocked at the campus firewall, hindering their ability to share information with colleagues and user groups. Campus network administrators, however, are charged with the task of ensuring uninterrupted network access for all campus users, by preventing malicious activity that could threaten the integrity of the whole network. An intermediary who understands the information sharing needs of the library, as well as the security issues faced by network administrators can help to generate a compromise solution that meets the objectives of both groups.

Instruction is another important skill that librarians can apply to the implementation of new technologies and projects. This includes the development of paper and on-line help documentation suited specifically to the knowledge level of the user group and delivery formats geared to the preferences of the intended users. Comprehensive on-line documentation can be developed, but this effort is wasted if users do not have easy internet access, or cannot find your site. Support is most effectively delivered by someone who understands the day to day working environment of their clients. The written word is no substitute, however, for formal face to face training sessions where users can ask questions and express frustrations. There are many ways in which librarians can use their strong service orientation, communication skills and teaching ability to ease user frustration, and facilitate the acceptance of new technology.

Systems office work requires a spectrum of management skills including the ability to plan projects, control budgets and supervise staff. Librarians bring these skills to the table. The pace of technological change can make long term planning appear almost impossible, but it is this rapid evolution that makes planning all the more necessary. Libraries devote large amounts of money to technology infrastructure, but they need to balance this with costs for facility maintenance, furniture, materials, staff expertise and good old fashioned books amongst other things. To be effective, technology planning must consider the larger mission and objectives of the library, as well as emerging trends and issues that affect the library profession as a whole. The nature of interdependent systems is that a change in one area often sets off a chain reaction of events. A decision to upgrade all computers to the Windows XP O/S may seem reasonable. If this however requires the library to replace or upgrade most of its PC hardware and a good chunk of its software, the benefits must be weighed against other projects with a larger impact on service delivery to the end user. Limited resources dictate that priorities must be developed to inform day to day decision making.

Money is not the only scarce resource that must be managed. Staff time is usually in short supply in the systems office, and it can be difficult to juggle normal operational demands with the development and implementation of new projects. This is particularly true when

any number of problems might emerge over the course of the day that require immediate attention. One of the biggest challenges in managing technical projects and staff is the ability to set realistic deadlines that are flexible enough to account for any number of glitches along the way. Projects must be scheduled according to the cycle of the academic year, and the ebb and flow of library work. Many of our major projects are completed during the small window between semesters, and users must be given ample notice of system down time. The ground work for major implementations must be planned well in advance and clear tasks assigned early on to accommodate unforeseen delays. Contingency plans must be made for the obviously risky aspects of projects, but so often it is the small details that cause major problems. Management, including planning, budgeting and staff supervision are part of the competency set that librarians can apply in the systems office.

It is an enormous advantage to come to the systems office with a ready made understanding of library practices and concepts. Librarians have, through necessity developed elaborate systems for organizing information. Understanding the purpose behind standards like MARC, LCSH, authorities, controlled vocabulary or Dublin Core is very helpful in understanding the unique demands librarians make on applications and interfaces. Reference experience using electronic resources for academic research, and observing the ways in which expert and non-expert users search for information helps to inform the design of new services. Having a broad understanding of the functions of all departments, and the way in which library work is organized is particularly useful for understanding the ILS, but also in understanding the needs and priorities of each division. Librarians also recognize the need for statistics to measure service usage and justify expenditures in a not for profit environment. A holistic understanding of library practices and principles is necessary in developing a vision for technology that will support the larger vision of the organization.

An often overlooked benefit of cultivating librarians with IT knowledge, as opposed to hiring non-librarians is the professional obligation of librarians to share their knowledge, skills and expertise with other institutions and associations. This ensures collaborative expertise remains devoted to developing systems that address the specific concerns of libraries and enables the dissemination of information to the library community as a whole. Seminars, conferences, workshops, professional associations, academic studies and publications are all part of the infrastructure that librarians have in place to ensure a vital future for the profession.

## Conclusion

Systems librarians have a great deal to contribute to our body of professional knowledge, but library schools and employers must work together to ensure that librarians have an opportunity to acquire the expertise they need to keep up with the demands of technology. It is no longer feasible to expect systems librarians to learn all of their skills on the job. Library schools must play a role in introducing new librarians to Integrated Library Systems and providing the basic technological skills that all library professionals should have in their tool kit. Employers need to provide ongoing training, but also recognize the limitations of short training sessions. Compensation packages for systems

librarians must take into account the outlay of time and money that extended IT education requires. Without a concerted effort to attract new librarians to the unique challenges of the Systems Office, libraries will relinquish control of their technology to computer scientists and information technologists. In doing so they stand to sacrifice a critical opportunity to secure a niche for librarians as the information experts of the 21<sup>st</sup> century.

#### Related Resources

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