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ABSTRACT

Traditional library tasks, for example database searching, are increasingly performed by library users, forcing both the librarian and the user to assume at times dichotomous roles of teacher and student. Modern librarians install new software and guide organizations in multimedia applications. Librarians need to be cognizant of the human factor, and how library users adapt to their changing role as information providers. This paper describes the automation experience of a medical library in France. The library implemented Windows NT as the library server, running applications such as KR ScienceBase and OPAC (Online Public Access Catalog), and automated interlibrary loan, book ordering, and serials. This paper describes the automation process at the International Agency for Research on Cancer (IARC), it looks at the effect of automation on end-users in terms of applying new retrieval methods, sources and dissemination techniques, and improving efficiency and cost effectiveness. Automation increased the prestige of the library in the eyes of library users. The library was seen to be better organized, more reliable, and technically knowledgeable. The degree of success in automating library systems depends on how much the scientist needs the system, and the organizational structure and management style of the library administrators and faculty. User adaptation depended on previous exposure, need to use the system, ease in using the system, direct incentives, and historical management tenets. (Contains 14 references.) (Author/SWC)

Library Users: How They Adapt to Changing Roles

By:

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Library users: how they adapt to changing roles

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Abstract: *The library has undergone drastic changes in the last few years: from centralisation to decentralisation; from practitioner to teacher; from passive to interactive information provider, knowledgeable in automation and new technology as it affects not only the manner in which the library performs its functions but, more importantly, the library user. Historical library tasks, e.g. database searching, are increasingly performed by library users, forcing both the librarian and the user to assume at times dichotomous roles of teacher and student (the scientist grudgingly becoming the unenviable student in uses of new technology as the librarian frantically reads the next chapter in the use of Macintosh Powerbooks). Modern librarians install new software and guide organisations in multimedia applications (that is, if the librarian wishes to retain credibility with the clientele). Librarians thus have to be cognisant of the human factor, and how the library users adapt to their changing role as information providers. The experience of one medical library as it implements Windows NT as the library server, running applications such as KR ScienceBase and OPAC, and its effect on end-users is discussed in terms applying new retrieval methods, sources and dissemination techniques, and improving efficiency and cost effectiveness.*

Keywords: Library automation, library services, user-computer interface

1. Introduction

The library user has been unexpectedly thrust into the unenviable realm: the lofty heights of experimentation. Like the scientist who runs tests to demonstrate known truths or validate hypotheses, the library user has been studied, debated, criticised and heralded as the technological new-age prototype, able to leap tall buildings in a single bound by simply surfing the net. The inevitability of direct end-user access to information products and services, and the concomitant transfer of said services from the librarian to the end-user, has been affected, like comedy and tragedy, by high expectations, tempered with apprehensions of misuse.

Is there a future for the end-user in online bibliographic searching? we (collectively) asked in 1981 (Ref 1). Is patron behaviour positive or negative? we postulated in 1982 (Ref 2). Is the librarian's credibility affected? we inquired as early as 1984 (Ref 3). Do university undergraduates perform manual literature searches in a costly and more time effective manner then computerised searches? (Ref 4). Does direct online searching increase flexibility, independence and cost effectiveness or decrease them? (Refs 5, 6) Do librarians as intermediaries to online searching really increase speed and currency of the information, reduce overheads, control costs and maximise resources? (Refs 7, 8).

End-users have been integrated into instruction programs (Refs 9 - 11), included in pilot projects (Ref 12) and charged for their services (Ref 13). Have we said all there is to say about the human factor of disintermediation (i.e. the process whereby information providers bypass traditional librarians and offer their services directly to the end-user)?

Technology is advancing at an increasing rate. There is no limit to what end-users can do. However, when faced with this deluge of opportunities (and at times dilemmas over optimum utilisation of time), how does the end-user react? Is it enough to give a one-day course in bibliographic searching or is the process of disintermediation more subtle? Have all the problems, benefits and improvements been addressed, especially as they affect ease of adaptation?

The International Agency for Research on Cancer (IARC) provides an ideal environment to study end-user adaptation to new services from a human perspective. The library is small, with holdings of approximately 4000 books, 11,000 bound journals and 200 on-going journal subscriptions. The librarian and two staff interact closely with approximately 200 library users, 50 of whom are temporary, for example visiting scientists or trainees, periodically replaced as new awards or training grants are announced. Research is conducted on a number of topics including epidemiology, genetics and virology. End-user needs at IARC are uniform in the types of information required and modes of delivery, and thus easier to monitor. Scientists work on PC and Macintosh applications, enriching the problem of accessing library services. The IARC Library used this diverse composition of equipment and library requirements to explore how the end-user adapts to changing roles, and the effect on the

role of the librarian, while converting from a fully manual to a fully automated library.

Today, after automation and disintermediation, the library educates new users in available library services, including PC and Macintosh applications for Medline, Current Contents, KR ScienceBase, Reference Manager, Netscape, FileMaker Pro 3.0 databases, MS Office products and specialised services available on a local area network. However, the road to success was not easy. This story is based on 'Necessity, the mother of invention' (George Farquhar), or rather, 'Progress . . . is not an accident but a necessity' (*Social Statics*). If 'education has for its object the formation of character' (*ibid.*) then this experiment was a resounding success!

2. Initial library automation

2.1. Interlibrary loans

IARC staff publish over 200 papers each year. Obtaining reprints not available in the library has always been of paramount importance. Since the mid 1980s library staff have identified new references through online searches, primarily of Medline/Cancerlit on Dialog. The resulting reprints were not always available in the IARC Library. Requests for interlibrary loans were manually processed, i.e. the library user filled out a request form and library staff either typed the request onto an interlibrary loan system, such as one provided by Dialog, or tried to obtain the item from other local libraries, usually by calling on the telephone. Record keeping — for example whether the requested article was received, length of time to receive requests and so forth — was non-existent. The library carried the cost of this service. As information flourished and the number of published papers increased over time, the number of requested reprints increased as well. The library budget deficit, sometimes amounting to $10,000, was made up from the travel budget and from equipment and supplies line items. Confidence in the library provision of interlibrary loans was at an all-time low, and budgetary over-runs were rampant. While the number of interlibrary loan requests increased, other library tasks increased as well. Needless to say, the number of library staff remained the same.

'Necessity, the mother of invention.' The library had to increase efficiency and performance. The most obvious change was to eliminate the multiple handling of interlibrary loans. The same reference was re-typed multiple times, by the requester, by library staff into reference-fulfilment systems such as Dialog and for follow-up. The same reference was typed by the secretary for inclusion in bibliographies. Statistics were manually compiled and record keeping almost nil. To complicate matters, administration clung tenaciously to historical tenets. The fear of abstracts replacing full text and potentially corrupting the pure scientific ethic limited automation to basically statistical analysis and wordprocessing using the centralised VAX WPS. Believing the need for efficiency was greater than the fear of insulting the scientific ethic, the library obtained a free UNESCO mainframe VMS database software called CDS/ISIS and established a database for ordering reprints. Database features (described more fully elsewhere (Ref 14)) included a simple Menu for library users for data entry, and a more complex Menu for library staff.

Thus, in 1989, a memo to all IARC staff announced the implementation of an automated interlibrary loan system and offered training in its use. The library user was not given a choice; as of a certain date, manual interlibrary request forms were no longer accepted by the library. A more detailed handout describing the database and data entry procedures was prepared and distributed to all potential users, and brief training sessions proposed. End-users were requested to use the same dumb VAX terminals used by secretaries for wordprocessing. An additional terminal was made available in the library.

The success of this interlibrary loan database was statistically confirmed: 652 reprints ordered in 1987, 1928 in 1991 and 3520 in 1992. The numbers fell to 2202 in 1993 due to the installation of a separate database for ordering reprints for the Agency monographs programme.

How did the end-user adapt? The younger visiting scientists/trainees who had already experienced automation in their home universities or institutes required minimal training. A half-hour course on accessing the database and entering the appropriate information was sufficient. Older scientific staff required more persuasion. Most of the Agency staff, including library staff, had never touched a terminal. Most senior scientists requested that their secretaries become proficient in entering references into the Order database: a workable solution, since most of the secretaries were already familiar with the VMS wordprocessing system. Secretaries may not have understood why they performed certain commands in a specific way, but understanding was not a requirement as long as they followed prescribed procedures and typed accurately. 'Progress, therefore, is not an accident, but a necessity.' If scientists wanted reprints, they or someone in their department had to learn to enter the request into the automated system. Initially, library staff were inundated with calls for assistance (instructions had been misplaced or there was not enough time to read them), especially when there were problems with the VAX which affected all systems running on it. Library staff eventually became knowledgeable not only in the CDS/ISIS program but also VMS commands and operating procedures. IARC staff were being pulled kicking and screaming into the 20th century.

Success breeds success. Staff who used the automated system raved about it to their colleagues. It was simple to use and ensured follow-up. Benefits to the end-user were straightforward and readily recognisable, in terms of decreased time and effort in tracking references and decreased frustration. Scientists (either directly or through their secretaries) gained untold hours per week which they more profitably spent in research. Of course, the one drawback to the user was the new ability of the library to charge back the cost of the reprint. Library staff

were delighted with the increased ease of managing a centralised ordering system. In spite of increasing orders, the fulfilment function itself was facilitated. Routine sorting/printing routines produced ASCII files uploaded to fulfilment sources such as the British Lending Library, or printed for faxing to local libraries who did not have e-mail. Library staff now had an organised procedure allowing automatic generation of not only listings but management reports. Library staff were able to process three or four times the number of reprints with the same number of staff. Productivity increased, efficiency increased, the budget stabilised and, beyond doubt, credibility in library services soared.

A concomitant benefit was the implementation of a common database for scientists' collection of reprints using the same CDS/ISIS software. Common fields were retained with the Order database where possible. Input was initially performed by library staff. As the demand increased, some scientists provided their own personnel for data entry. Instead of throwing their reprint onto an ever-growing pile(s) on the floor, reprints were now systematically numbered and stored on shelves. Most scientists who participated in the Bibliographic Reprint System (BIB) learned how to access it themselves or requested their secretaries to learn. Some scientists requested that cards be produced, alphabetised by author, continually updated and accessible. The system became especially valuable when urgent requests were required to meet tight manuscript submission schedules (did I already request this article? did I receive it? where did I put it?).

Thus, the Order and Bib databases for interlibrary loans and staff collections of reprints had an overall positive effect on patron behaviour. The speed of retrieving reprints definitely increased, and costs were more efficiently controlled.

2.2. Book orders

The next library function to be automated was the ordering of books. The library purchased 171 books in 1990. This number increased to 274 in 1991. Even though the numbers were small, manual files maintained by title and source of fulfilment were no longer effective or manageable. The paperwork required to process each book was extensive. All books were ordered directly from publishers; requests for status reports or outstanding orders were provided after painstaking research; follow-up was nil. Scientific staff were convinced that the manual procedures were slow, expensive and inefficient. In addition, Author, Title and Subject catalogue cards had to be typed and filed when the book was received: a tedious and time-consuming project. A book ordering system was created using the CDS/ISIS database management system.

The book ordering system was more successful with library staff than with library users, for a number of reasons. Even though the interlibrary loan and book ordering databases were similar, the book database was more complex. Secretaries were more familiar with the former, having typed more interlibrary loans than book orders. Even though detailed instructions were provided, they were not consulted. The software, while easy to use for data entry, required knowledge of not only Boolean operators but command language for searching and printing. Users with no database experience hesitated to learn something that seemed complex and foreign. The amount of instruction did not make any difference. Those staff who could, did, while others called on the Library for help in data entry or to search/print. Library staff, however, found the system not only exciting but more efficient and effective than manual files. Duplication of orders, lost orders or unfulfilled orders were easily identified. Information about each order was now available in detail, describing sources of fulfilment, cost and so on. Costs were easily tabulated for management reports. Library staff processed increasing numbers of orders with less time.

Cataloguing information (e.g. ISBN, Call Number) was entered into the database in addition to ordering information. Catalogue cards by Author, Title and Subject were now produced and printed by sorting/printing routines. Over time it became increasingly obvious that library staff were duplicating the effort: the information already existed in the Book database. Manual catalogue cards were retained mainly for the benefit of staff members who refused to learn how to use automated systems. Library staff decided to discontinue this process and use the online Book system to enhance the manual card catalogue. Library staff were consulted frequently for recently-received books on particular subjects. Even though full automation of the entire catalogue was advertised by word of mouth or by means of the quarterly Library Bulletin, library users insisted on using the outdated catalogue cards.

Scientists suffered during this interim period by not having access to books currently on shelves. Library staff spent considerable time in answering simple reference questions. Even the younger trainees/visiting scientists who consulted books more frequently found using a database management system more difficult than a library online public access catalogue. Users found the displaying and printing of search results cumbersome, especially when knowledge of database commands was required. Whereas reprints formed an integral part of the research effort, books tended to be more academic. Perhaps the very nature of a research institution dictated the success or failure of a specific activity. Reprints formed the lifeline of the research community. In order to publish, one needed access to current information. Or perhaps the real roadblock was the traditional manner of management, i.e. delegating the rudimentary tasks to support personnel. The different levels of expertise were clearly delineated. It wasn't until Bill Gates sat down at his own PC and started typing that the traditional manner of management changed, and it changed faster in the US than in Europe.

2.3. Online public access catalog, serials

Library staff evaluated CDS/ISIS as a means of replacing the Kardex. However, the software could not perform all the required functions associated with a full OPAC. Journal check-in — a three-dimensional model consisting

of receipt dates, publication dates, volume and issue information based on a calendar year — could not be programmed, nor could claim fulfilment. Bar codes were not available. The library thus arranged to lease the Soutron Library System, a VAX program accessible to all personnel through the same terminals, as the interlibrary loan and book ordering systems.

Journals were automated first. Library users were encouraged to use the system to identify journal receipt dates, answer volume/issue queries, and so forth. The library arranged brief training sessions in how to search and print journal information. However, the software was considerably different from that used to order interlibrary loans and books. Library users were resistant to learning yet another set of commands. It was easier to come to the library than query the online system. The OPAC was mainly used by library staff who found the jobs of claiming missing issues, printing reports and managing subscription information much simpler than performing the tasks manually.

Archival library books were entered onto the Soutron Library System after the conversion of journals. A number of library users bemoaned the loss of the traditional musty smell which wafted up when flicking through the cards. Once again, the library was lauded for its initiative and increased efficiency while the usage of library services declined. Once again, temporary staff — i.e. visiting scientists, trainees — were much more enthusiastic about using automated library services than permanent staff. Older scientists were not used to VAX dumb terminals and preferred to delegate this function to support staff.

And then came the turning point. It came at a time when some scientists had already obtained their own Macintoshes or PCs for specific projects. However, use of these machines was haphazard and limited by the scientist's ability to find applicable software independently. Installation often proved a nightmare. The administration changed and this changed the way people worked. PCs were purchased for all secretaries and MS Office, which includes Word, Excel and PowerPoint, was installed. The biggest global change was the standardisation of dissemination of information about systems and software which might have applicability not only to office-oriented tasks but to their installation and maintenance.

3. Continuing automation of the library

In 1988 the IARC Library ran 102 monthly current awareness updates and 725 retrospective searches on Dialog. An analysis of the cost/benefit of searching Medline/Cancerlit in-house on CD-ROMs showed a potential savings of $8000/year. Two CD-ROM towers were purchased and placed in the library at approximately the same time as initiation of the interlibrary loan and BIB systems. This in-house ability to search Medline not only provided a cost/benefit, but it provided a quicker turn-around in search results and it eliminated problems experienced with modem connections.

Once the in-house availability of Medline/Cancerlit became known, a few scientists expressed interest in using it during evenings and weekends. The library PC was made available on a strict access basis. However, the scientists did not have the time to learn the system thoroughly (e.g. searching MeSH terms) and library staff were not available to give immediate instruction. Searches were performed in a somewhat haphazard manner. It quickly became evident that due to the broad nature of the searches, more information was retrieved than absolutely required. This ineffective retrieval meant more work in weeding out false drops and quality control. Library staff, appalled, assumed that some justification was warranted, considering the increased independence, flexibility and self-confidence in using library services. The number of scientists using Medline was small; however, it was encouraging.

Use of the library PC by end-users resulted in problems: for example the PC was used for services other than strictly Medline searching. At times, even the AUTOEXEC.BAT and CONFIG.SYS files were changed. The library decided to purchase two InfoServer CD-ROM towers which allowed the CDs to be networked and accessed directly on the user's PC or Macintosh. This decision was enforced by the increased workload and the overall management decision to delegate certain library functions directly to the scientists.

'Necessity, the mother of invention.' Genetic research required access to gene sequences. The retrieval of records from the sequence databases at the National Center of Biotechnology Information (NCBI) became available, initially through telnet and then through Mosaic or Netscape. This inspired not only interest but enthusiasm for direct participation in the search/retrieval process. Scientists wanted to input their own queries. Equally as important, they wanted to submit their own sequences to the database. The atmosphere became increasingly positive towards automation. Scientists were encouraged to use their PCs and Macintoshes for more than just analysing data. Multiple licenses were purchased, not only for Reference Manager but for Current Contents as well, and made available to each scientist on his or her PC or Macintosh.

To sweeten the learning process, the library encouraged training in 'fun' kinds of activities. E-mail became a great motivator. When scientists discovered that they could communicate with their colleagues instantaneously (or alternatively, were asked by their peers for their e-mail addresses), they accepted more readily to learn how to type their messages. The learning process differed between scientists. Some ranted and raved, frustrated with their own inadequacies in grasping technical concepts. Others developed their own methods which may not have been the most practical but worked. Netscape became a great leveller. Foreign scientists learned how to access local newspapers on the Internet in their native language. Slowly, over a period of six months to a year, all scientists were performing some functions on their PCs or Macintoshes. 'Education has for its object the formation of character.' Surely the majority of the scientists concluded that things would never be the same again.

Value-added services became indispensable: data was reformatted and transferred across library services,

resources were used more efficiently. Sixteen simultaneous users connected to Medline, an all-time high, and the OPAC became a part of the every-day routine, as demonstrated by the increased activity in borrowing.

It became the library's responsibility to install and maintain the software on individual PCs and Macintoshes. No matter that the librarian had never touched a Macintosh in her life. 'Trial and error' became the key terms for success. Had not the library spearheaded automation by establishing the first 'public' online services? It was certainly to the library's benefit to encourage and enhance automation. The role of the librarian dramatically changed to incorporate not only an educational aspect but a more technical one — that of computer specialist.

The increased independence and flexibility of scientific staff markedly affected library staff. Did this mean that, in the long run, library staff would become redundant? Were they deliberately doing themselves out of a job? The fear lasted only a very short while. The redundant clerical functions now performed by automation were replaced by educational and technical responsibilities. Library staff ordered books on PCs and Macintoshes, learned how to 'surf' the net, became conversant in installing software. They were doing more work than ever before! But the work was different — and more satisfying, once the initial fear wore off.

It was not just the end-user affected by automation. The activities and functions of secretarial staff changed as well as those of computer services staff. Whereas the viewpoint was initially very narrow — for example, VAX applications for biostatistical analysis or wordprocessing — the objectives gradually broadened. Computer services staff found themselves reviewing general purpose software — e.g. Eudora for e-mail, Netscape, etc. — and setting up networks to allow communication with the outside world. Things started to snowball and computer staff were increasingly intertwined with individual demands and requests. Initially they resented this additional workload; in the long run, the benefits gained by the Agency as a whole outweighed any discomfort.

4. Conversion to Windows NT

Even though all the systems worked, and the end-users could do practically anything they wanted, system software was disparate: some systems worked on CD-ROM, others as PC applications, and still others as VAX programs (Figure 1). The networking software, Pathworks, only accessed seven CD-ROMs at the same time. Medline was on 14 CD-ROMs. Thus, routines had to be written to disconnect connected CDs and to reconnect to another set of years. Each time the configuration changed the programs had to be re-written and end-users alerted. The one VAX server which serviced all the users created problems. Peak hours of usage resulted in long delays. Some programs hung up the system, thus creating instability. The library was faced with an increasingly computer-literate user community which became increasingly distraught by the different kinds of systems running on different platforms using different commands. If the PC became too charged and DOS was not able to handle the installed programs, end-users had to reboot to suppress certain programs that took up an inordinate amount of space. If the end-user forgot to reboot, the program did not work.

The Library received news that Win/MacSpirs would become available on Windows NT. At the same time, the suppliers of the Soutron Library System advised that the VAX programs would only be maintained through an Alpha box, Open VMS, or through Windows. The CDS/ISIS software was being beta-tested under Windows. Everything pointed to Windows NT and the library reconfigured accordingly (Figure 2).

A schedule was proposed to convert the various library databases to Windows NT. Library users were notified through a seminar to expect changes within the next few months. Most PCs had to be upgraded from Windows 3.1 to either Windows 95 or Windows NT client, to allow communication with the Windows NT server. All library users benefited from the conversion, not only in better management of memory and multiple applications but also in more standardised systems.

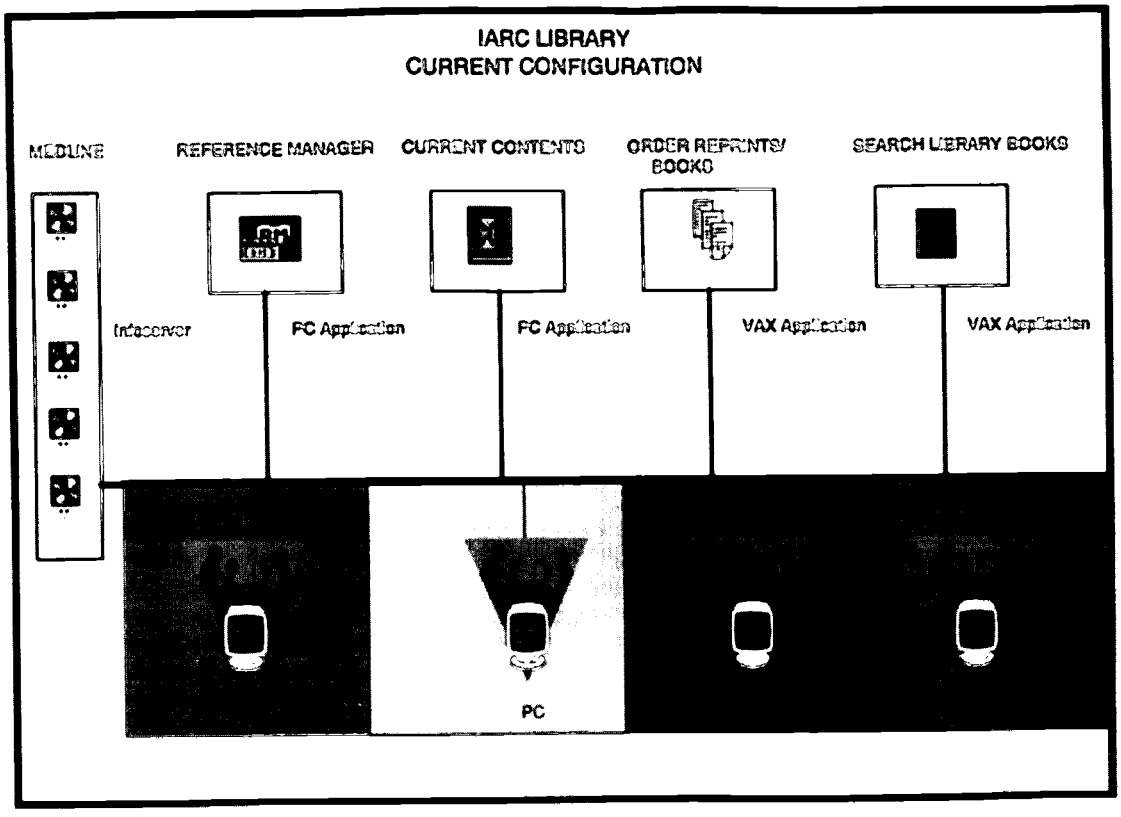

Figure 1: IARC library current configuration.

5. Discussion

Library users initially developed into three types of categories:

(1) Visiting scientists and trainees formed the most important group of users. They were already familiar with automation and consistently pushed the Agency to advance the capabilities. They embraced the opportunity to grow and expand their base of knowledge. However, they never stayed long enough to impact the permanent staff and new recruits had to be trained repeatedly.

(2) A second and smaller group consisted of those who did not know automation but accepted it, and tried to adapt to it. They may have used secretarial support in inputting interlibrary loans, but they learned how to search their reprints in the BIB system.

(3) The third group consisted of older scientists who clung tenaciously to the old ways of doing things. This group formed the majority and relied heavily on secretarial support to bring them up to par with the rest of their colleagues. Eventually, they realised they would have to learn new techniques and technologies if they wanted to keep up with progressive administration and not be left behind. These scientists who wrote their manuscripts longhand clung tenaciously to their VAX dumb terminals.

The learning curve was very slow and painful. Technical difficulties and problems initially caused a great deal of frustration and impeded automation. However, incentives for learning became increasingly available. Direct access to PCs on scientists' desktops facilitated the learning process: scientists could now access Medline, Current Contents and Reference Manager after normal work hours or at weekends. The facility to search Medline and/or Current Contents, export the results into Reference Manager and print bibliographies added a great deal of value to their effort, as did specialised searching, for example genetic sequences.

Macintosh users had different kinds of problems. The programs were one grade behind the PC versions. For example, Reference Manager Version 6 databases had to be converted to Version 5 before they would run on the Macintosh. This meant, at times, the creation of the same database in another version: a time-consuming process, assumed by the library. There was much less expertise in-house to deal with Macintosh problems. WinSpirs users were happily searching for six months before MacSpirs users found the appropriate software which allowed the Macintosh to communicate with the InfoServer towers housing the Medline CD-ROM discs.

Automation increased the prestige of the library in the eyes of library users. The library was seen to be better

organised, more reliable, technically knowledgeable. However, this incongruously did not mean increased use of library services. Some services initially decreased, such as the willingness to live with and access only part of the books as long as the archival card catalogue was available. The library staff were initially more enthusiastic about library automation than end-users.

The conversion to Windows NT was an anticlimax. The hard part was already done. By the time Windows NT came along, all library users had experienced automation to some degree. Life simply became easier with standardised systems, a more stable environment and, hopefully, quicker response times. If the VAX hung up or crashed, library services could still be accessed. End-users would no longer have to use VAX emulators to access the OPAC, interlibrary loan and book databases. No longer would they have to reboot because of memory handling problems or change discs to access various Medline years.

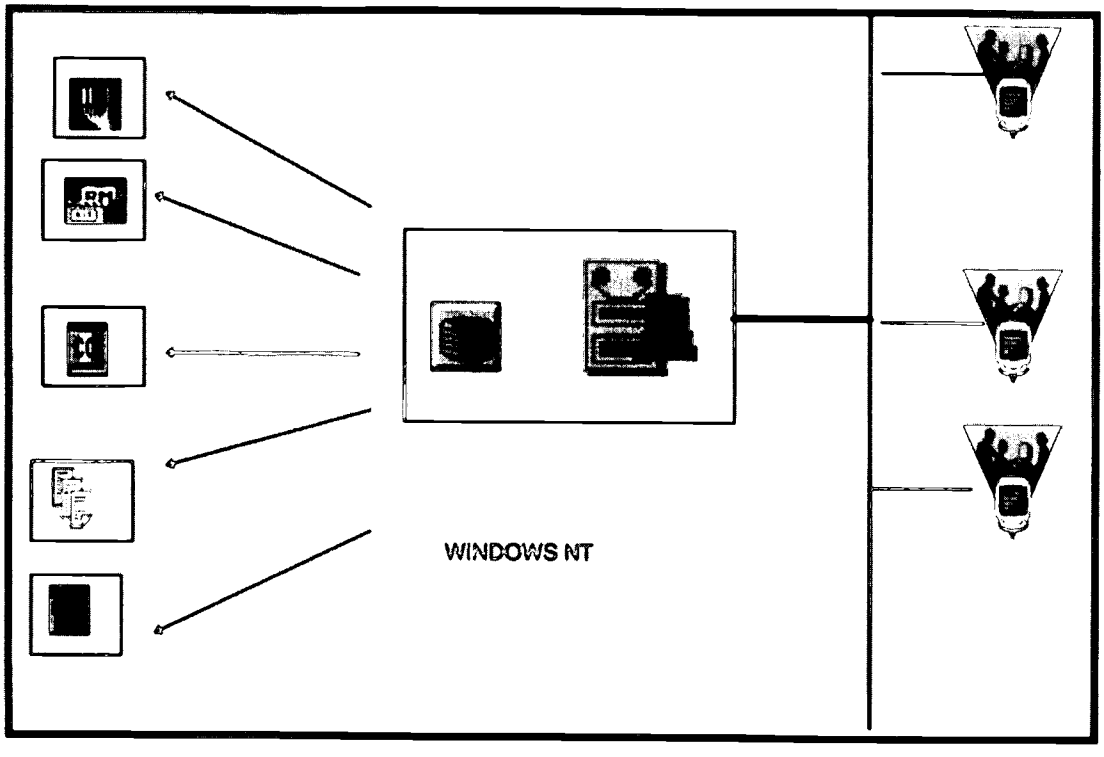

Figure 2: IARC library Windows NT configuration.

6. Conclusions

The degree of success in automating library systems depends on how much the scientist needs the system, the organisational structure and the management style. Initial automation was possible only because IARC operated on a 'laissez-faire' basis. Full-scale automation proceeded as quickly as it did only because administration encouraged, indeed, demanded it.

Training played a smaller part in the success of a system. No matter how many sets of instructions were issued, users preferred systems which worked under Windows where instruction was self-explanatory. Inventiveness played a large part in facilitating the learning process. The end-user recognised the added value of automation.

Adaptation thus depended on previous exposure, need to use the system, ease in using the system, direct incentives, and historical management tenets.

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