
Making Connections: Computerized Reference Services and People

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THE TERM *computerized reference services*, once synonymous with online searching of external databases, now encompasses a much broader range of activities. As the concept has broadened, so has the role of the librarian as an intermediary. The end user's role has also broadened from that of passive recipient to active searcher. Problems of cost, instruction, standardization, space, and security have never really been resolved, either for librarians or for end users, and these problems continue to hamper the full development of computerized reference services.

The last issue of *Library Trends* which dealt with reference service was published in 1983. Since that time, the increased availability of computerized reference services has forever changed the map of reference. Graduate students, given a list of arcane or partial citations to identify in a bibliography course, can now side-step many traditional printed tools and complete their assignment using OCLC or RLIN. Undergraduates flock to their library's BRS/After Dark, Wilsonline, or InfoTrac terminals for term paper citations, and refuse to accept more traditional search methodology. Faculty members and business people increasingly do their own end user searching in their offices and homes without actually entering a library at all. Such developments, unthinkable several years ago, are now a fact of life and entail a variety of opportunities as well as dilemmas for the reference community.

As one would expect, library literature has burgeoned with articles, conference proceedings, and unpublished reports on computerized reference. Increasingly, this literature focuses not just on technology but also on the connections between technology and people—both staff and

patrons. In the 1983 *Library Trends* volume, only two articles discussed online reference services, but both of these acknowledged the human interface. Thelma Freides (1983) pointed out that the computerized reference situation mandates the librarian's involvement at every stage, from formulating the question to evaluating the result, thereby providing both a model for the patron and an educational process for effective literature searching (p. 463). Bruce D. Bonta (1983) made the point that the maturing of online reference service will allow librarians to realize the inherent value of their intermediary roles, and he also drew attention to the instructional role in teaching end users to do their own searches. His article summarizes the debate at that time about whether end user searching would deprofessionalize the reference librarian's role.

As we leave the 1980s we face a confusing panorama of technologies and concepts embodied in such phrases as "end user searching," "gateways," "CD-ROM," "vid-tele-reference," "CAI for BI," "optical and video discs," "expert systems," "artificial intelligence," and the "scholar's workstation." This is a world not envisioned in 1983. This article will survey and describe the technological developments which have affected the reference function since that time, and discuss the effects of the computerized reference environment on the administration of reference service, including the effects on librarians and on users. Online public access catalogs, although obviously an important part of the computerized reference environment, are defined as outside the scope of this article because they are treated extensively elsewhere within this issue of *Library Trends*.

ONLINE DATABASE SEARCHING—BIBLIOGRAPHIC UTILITIES

Two basic kinds of online database searching may be identified and discussed in terms of their effect on the reference process and on the user: (1) searching of the bibliographic utilities (OCLC, RLIN, WLN, UTLAS); and (2) searching of "subject" databases created by a variety of database producers and generally made available to the public through commercial search services (DIALOG, BRS, ORBIT).

The earliest major computerized reference tools were the cataloging database of OCLC (originally named for the Ohio College Library Center which fostered the database), and soon thereafter the databases of the Western Library Network (WLN), Research Libraries Information Network (RLIN), and UTLAS (originally University of Toronto Library Automation System) in Canada. Although OCLC was designed as a cataloging rather than as a reference tool, reference librarians had realized its value for reference services by the mid-1970s, and began lobbying to have terminals placed in public service areas for both librarian and public use.

The problems encountered with public access to OCLC (and the other "cataloging" databases) were similar to the problems and opportunities inherent in all computerized reference sources. Terminal avail-

ability was greatly restricted by OCLC in order to control traffic on the network; the cost of terminals, especially for smaller libraries, was a major factor; and there was considerable fear of machines on the part of public service staff. It was not until the early 1980s that public service librarians' use of these tools became common. A study of articles indexed in *Library Literature* for the period 1970-82 yielded only twenty-seven items which discussed both OCLC and RLIN, and only three of these dealt with the use of RLIN at the reference desk (Stratford, 1984). Baker and Kleugel's (1982) study of the reference use of OCLC surveyed sixty-three ARL libraries' main reference departments by telephone and found that only twenty-four reference departments were equipped with their own OCLC terminals, and of those twenty-four, only nine allowed direct patron access (p. 380). A more recent review of the published literature describing the use of RLIN at the reference desk describes the paucity of solid research articles about its reference use and claims that "although most authors ably inform us of the potential of RLIN, very few have tested that potential in any meaningful way. The resulting impression of usefulness does not yet justify the expense of placing RLIN terminals at the reference desk" (Bennett, 1986, p. 476).

SEARCHING VERSUS TEACHING

A classic dilemma faced by reference staffs dealing with the cataloging databases was whether to act as intermediary for the public or to make the terminals directly available to the public. Even where terminal availability was not a problem, there remained the question of cost (especially for RLIN searches), and the question of teaching the use of OCLC's idiosyncratic searching keys. Nevertheless, at many libraries, public use terminals were made available, and lengthy instructional materials were created by librarians.

In those libraries which did offer public searching, faculty and students discovered that with a modicum of training, they were empowered to do research which obviated extensive reliance on more cumbersome printed tools. For many library users, OCLC was the first "computer" ever encountered, and its availability established in their minds (rightly or wrongly) that libraries were in the forefront of automation.

For reference librarians, the advent of OCLC and its cousins was equally important. For the first time they found themselves the stewards of an important and impressive new technology with a corresponding increase in their self- and public image. For many reference librarians, instructing patrons about the use of OCLC, once they had mastered it themselves, constituted a first experience with bibliographic instruction; now they had a vital instructional role to play involving a prestigious new technology.

ONLINE SEARCHING: COMMERCIAL DATABASES

The other side of the online-searching coin during the 1970s and early 1980s involved the great variety of databases created by both

for-profit and nonprofit companies and government entities and made available to libraries primarily through the "supermarket" commercial vendors—principally DIALOG, BRS, and SDC-ORBIT in the United States. Their development and introduction into the reference service mix were roughly contemporaneous with the availability and dissemination of OCLC services, although their impact was not as widespread in most libraries.

To a greater extent than with the cataloging databases, online searching of the "subject" databases began in libraries as a back room operation in which librarians functioned as guru-intermediaries performing mysterious searches. Online searching in the early 1970s was primarily common in special libraries, where charges could be built into the cost of company products or covered from grant funds. Academic libraries tended to pass along all or a large part of the online searching costs which resulted in limiting the number and extent of online searching activities.

For those students and researchers who could afford it, online searching in the 1970s did offer a revolution in search capability, with its powerful subject, Boolean, and full-text access. The searching power of the software was a revolution after the cumbersome search keys of OCLC which offered no subject access at all. As a result, the reference librarian was empowered to cut through much tedious manual searching and in some cases was able to discover information which traditional manual searching of printed sources could not have yielded except perhaps through serendipity. This capability enhanced the quality of the reference interchange, and in many cases librarians felt that their prestige was enhanced as well.

The first national conference on online services occurred in 1979, and, in 1980, *Fortune* reported on the online industry's 600 databases. There was a notion abroad that the growth of databases would be exponential, and that printed indexes, in many cases, would disappear. This has not happened primarily because the volume of searching did not increase to the extent once predicted. The major factor which has inhibited the growth of online searching of commercial databases in academic and public libraries has been cost. Royalties to the database producer, per-minute search charges to the vendor, and telecommunications costs combine to make such online searches highly expensive, especially for academic, public, and school libraries which are not funded for open-ended costs and are not in the for-profit sector. The usual answer has been a partial or full charge back. However, the average user continues to be unwilling to spend large amounts of money to secure information. As a result, most online searches have continued to be performed by trained reference searchers, supposedly in the patron's best interest, because he or she was likely bearing a large share of the cost. The stakes, for many years, were simply too high to entrust the keyboards to the public.

This "priesthood of searchers" was not viewed universally as a bad thing in the library profession. Indeed, it was viewed by many as a way to gain recognition as a profession distinguished for its specialized skills. The notion of public dependency was perceived as a positive good which would place librarians more in line with the medical and legal professions, whose members themselves would be dependent on librarians for information which they could not locate themselves.

Others in the profession were not sure about the value of exclusivity. Frick (1984) argues against allowing patrons to become dependent on intermediary expertise, as it results in "technostress." Instead, she saw the librarian's role as fostering self-help, shifting from expert-authority figure to consultant. Norman Stevens (1983) stated:

If online database searching is to become fully integrated into every day reference service in all libraries, some drastic changes in our way of thinking, the marketing of such services, and our methods of operation will have to occur....Until the terminal is located at the reference desk and not isolated in a small closet at the back of the reference department and all reference librarians, and not just a select few, use it on a regular basis, online database searching will be of limited value. (p. 78)

Another article reports the findings of a survey of ready-reference use of online databases in 1982. Of the sample of 1,290 librarians from all types of libraries, 43 percent did not use online searching very much or at all at the reference desk, and of the 57 percent who did, most of them were also the people responsible for the regular, in-depth online searches (Hitchingham et al., 1984).

The early 1980s also witnessed the first of the consumer-oriented, multipurpose online services, the Source; the practice of, and copyright concern about, downloading; and the introduction of the "user friendly" online services BRS/After Dark and DIALOG's Knowledge Index. Database vendors introduced these alternative, fixed, or lower cost online services primarily to extend their markets by making online searching more available and affordable. They were intended for the end user but in fact were used chiefly by librarians to extend accessibility and control costs. These systems have been moderately successful at extending accessibility to databases, and have opened up searching as an end user service, although, even with the simplified searching techniques required, librarians find that some people still need considerable instruction. A new dimension has emerged for the reference librarian's role as instructor.

Through the mid-1980s the problem of end user accessibility to databases continued to vex the profession and was the central theme of RASD's Machine Assisted Reference Section at the summer ALA conference of 1985. A 1981 ALA survey of 985 libraries revealed that 72 percent charged a fee of some kind, most commonly in academic libraries (ALA, 1982, p. 56). No one really knew how to resolve the issues of cost, staff time, and machine accessibility. Peischl and Montgomery (1986) captured the issues in the following statement:

Nothing is free; some services are offered as traditional fare while others, such as external online searching, may carry a direct user fee. This question is not

only philosophical, but very practical because each service bears an opportunity cost; that is, if you choose to do one thing you give up the opportunity to do something else. Therefore, if a library chooses to launch a concentrated online retrieval program while enduring fixed overhead costs of space, personnel, and operating budgets, something else must give and not be done. Few reference services have had the luxury of additional resources to launch a new service. Therefore, stress has been added and priorities have changed, *de facto* rather than formally, as more searching is requested. (p. 350)

The usual compromise was a two-tiered searching program in which patrons paid for in-depth online searches in whole or in part, while the ready-reference searches were paid for by the library as a normal part of reference service, if and when such searches were conducted. In this way costs were tightly controlled, staff time tightly scheduled, and searching maintained as a professional activity rather than as an end user one.

OPTICAL DISC TECHNOLOGY

The log-jam regarding end user access to databases is currently being broken by the implementation of optical disc technology. Such technology offers much of the power and features of online searching at a fixed cost. The amount of searching is open-ended, and the patron can more easily use the simplified search systems without much instruction. While not an online tool, it appears to be a free online searching system to the end user, thus attracting users and potentially expanding reference tools to a wider audience. Some claim the impact of CD-ROM (compact disk-read only memory) to be as significant for reference service as online searching was in the 1970s.

This new technology began to appear in libraries in 1985 in the form of InfoTrac, a microcomputer-based index to (at that time) some 900 popular periodical titles stored on a video disc. Users quickly adopted InfoTrac and it became popular immediately. Much has been written about InfoTrac, both pro and con, although few dispute its popularity (Kleiner, 1987). No matter what its limitations, it is truly an end-user reference tool, requiring virtually no instruction, although some advocate the need to make users aware of its limitations and its place in an overall search process (see for example Van Arsdale & Ostrye, 1986). InfoTrac now offers full-text access to the last three months of the *Wall Street Journal*, and in its new compact disc format allows access to ERIC, Disclosure, and other CD-ROM databases all through the same workstation.

From a library's perspective, the CD-ROM-based reference tools, though expensive, at least offer end user searching at a fixed and predictable cost. Bartenbach (1987) has explained aptly the primary reasons for the huge success of CD-ROM such as local control; end user access; predictable per search costs; unlimited access; and privacy. He believes that the psychological advantages to users are the absence of a sense of time pressure or concern about costs and more privacy. Some librarians are concerned about the popularity of these tools and their

potential for subverting the traditional activities and educational mission of the reference function because many students prefer these systems to traditional printed indexes and abstracts, even where the materials indexed are clearly inappropriate for the work being undertaken (Van Arsdale & Ostrye, 1986). Patrons, however, have few qualms about the technology, and it is rapidly gaining a strong foothold in libraries. Pemberton (1986) described college students' use of InfoTrac thus: "They learned quickly on their own....took pride in teaching a friend...became repeat customers...refuse to accept an alternate information source...they stand around and wait for it to free up...[They] are voting with their feet" (p. 11). Paula Watson (1988) offers the most poetic description of users' responses to CD-ROM:

Librarians should take into account the delight of the user in this technology. Perhaps a little reminiscent of joy-sticking through Space Invaders, the user opens new worlds of information with the touch of a few buttons. It is the knowledge seeker's own ship to be flown single-handedly and freely to any subject in the universe of information on the disk. (p. 50)

Until recently, compact disc reference sources have been limited to one person per workstation at a time, are not as current as online resources, and are somewhat slower than their online counterparts. These are not disabling drawbacks, especially in the area of currency; those needing total currency can still go online in most cases. The technology for multiple access to multiple databases is making headway in the marketplace. More serious problems for libraries include the cost of subscription to a burgeoning list of compact disc resources, the cost of hardware necessary to access these resources, and the space necessary for hardware and user workstations. Watson (1988) reports that many institutions are using nonrecurring funds to purchase the equipment and initial subscriptions necessary to implement compact disc technology (p. 45). Some libraries which have acquired optical disc products or are planning to do so are also charging or planning to charge for the use of the systems. Others have cancelled or are considering the cancellation of hard copy reference resources, just as had been done when based on online access. Beltran (1987) suggests considering cancellation of expensive cumulative indexes—such as the *Comprehensive Dissertation Index*—in favor of the CD-ROM product.

OTHER AREAS OF REFERENCE AUTOMATION

It is possible that librarians have not yet really begun to tap the potential of automation to enhance reference work. One of the most recent developments just beginning to affect reference service is the application of artificial intelligence research and expert systems. There are several products on the market now calling themselves "expert systems," which are microcomputer-based, interactive expert-type programs that provide readers' advisory services, such as "Bookbrain" and "Librarian's Assistant." A few articles have appeared which describe

programs that suggest reference sources for a particular query, such as the National Agricultural Library's "Answerman" (Waters, 1986). Another describes several programs and operational examples of expert-type systems which greatly improve the user interface for searching online databases and online public access catalogs (Kesselman, 1987). One writer even makes claims that such systems will help remedy the problem of half-right reference service (Cavanaugh, 1987).

Meanwhile, other automation initiatives are affecting library users today. Some current examples of reference automation may indicate the range of efforts underway. At Georgia Institute of Technology, the library has acquired site licenses to mount several online databases on the university's mainframe, along with BRS search software, thus bringing to users the power of online database searching integrated with the library's online catalog and searchable from every campus office and, indeed, from off-campus as well (Drake, 1987). This integration of "external" databases into the library's online catalog is a clear trend. At Ohio State University, the ERIC database and the U.S. Government Printing Office database have been added to the basic online catalog of holdings, and other libraries which are members of the Center for Research Libraries have added that specialized repository's holdings to their own online catalogs. Similarly, libraries have begun to add the holdings of other area libraries to their own databases in one conflated online catalog. Such multi-institutional database building blurs the distinction between institutional holdings and database searches of external resources and constitutes a "mini-OCLC" type of database for interlibrary loan and other purposes, the searching of which does not entail the costs levied by the traditional cataloging databases. Networks are also producing compact disc confluations of member institutions' holdings which the end user can search directly.

An important development in recent years is the involvement of libraries in the archiving and servicing of data tapes from governmental and other entities, especially in the social sciences, from the Inter-University Consortium for Political and Social Science Research. Some libraries merely house such materials while others engage in front-end programming which facilitates use of the data by faculty and students. Such work represents a rather high level of professional involvement in end user activities, and tends to have high public relations value, both for the library and for the academic departments which use the services for research activities and recruitment of graduate students and new faculty.

Librarians continue to innovate in response to automation. Some initiatives which have occurred as a result include community information and referral files which are maintained and updated online and even shared regionally through online catalogs. Librarians have made use of their external database search capabilities in order to create files of database searches on "hot topics" (Jacobson et al., 1984). KWIC and

other key word indexes to title words of works in reference collections enhance access at some libraries and enable reference librarians to maintain much better awareness of the collection and maximize use of materials (Farber, 1987). Finally, it should be mentioned that librarians are using "traditional" microcomputer technology and software both in terms of reference tools such as Value Screen and Trinet Establishment Data, which are available only on floppy disc; and in terms of software to do such things as automate desk schedules and update bibliographies and handouts more easily. Clearly automation in reference has been creatively employed by librarians to produce new tools and services.

IMPACT OF AUTOMATION

Taken together, the existence of automation has obviously had a great impact on the materials, methods, and conduct of reference services. Computer-based reference has expanded subject access, saved librarians' and users' time, and generally improved service. The ability to search by keyword virtually any part of an online or on disc record, allows researchers more creative and powerful access to information than was previously possible, and leads to the uncovering of additional relevant information and resources. Patrons' expectations have risen as a result of computerized reference sources. However, they sometimes falsely assume that the full-text copy is as readily available as the bibliographic information so easily obtained by database searches. Fortunately, along with the increased bibliographic access to information, librarians have yoked a greatly increased physical access to materials for users through the OCLC interlibrary loan system and other networked ILL arrangements. Now with such a variety of document delivery services, and the promise of an increasing number of online or on disc full-text articles, interlibrary loan, while still the mainstay for most documents not owned by libraries, is but one of several document delivery options. In general, it is probable that had libraries not embraced automation for reference and public service, they would have lost much credibility in the public eye as an information resource, and would be in a much worse position in competing for municipal, corporate, or university funding for traditional materials as well as for automation needs.

Nevertheless, for all of its positive impact, automation has not had the far-reaching consequences which many might have predicted for the reference function for users and for libraries. Reference departments are still structured much as they were ten to twenty years ago, although there has been a trend toward integration of formerly separate online search services into the reference department. Automation activities are still localized in particular positions, such as "coordinator of online searching," instead of being so widely distributed that they are taken for granted as an integral part of reference service. There is a tendency to

decentralize and to distribute searching activities to the end user, but this trend is tempered by the current necessity, at most institutions, to conduct end user searching in the library, even while the online catalog may be searched in the home or office. In the area of materials, the reference collection still appears identical or nearly so to that which may have been seen decades ago, except that there is also an overlay of online and on disc resources. While most libraries that have acquired optical disc products are locating them within the reference area, at least one has organized a separate compact disc and online reference center staffed for nearly all hours the library is open (Tucker et al., 1988).

The rapid influx of computerized reference tools and the integration of online ready-reference searching at or near the reference desk are probably partially responsible for an increase in the stress and burnout associated with the work of the reference librarian. Little research has yet been done in this area, but the pressure on reference librarians to develop online searching expertise and stay knowledgeable about a large number of reference tools in various formats could only increase the stress associated with burnout and the "struggle to do a job that is never really done" (Smith & Nielsen, 1984, p. 221).

Smith and Nielsen are the only ones to have applied the Maslach Burnout Inventory to a group of librarians so far, and their findings did not point specifically to online searching as a culprit. However they studied a group of special librarians who were probably more attuned to machine-based reference than the average reference librarian. It is no secret that most reference departments of any size (and indeed, many small departments as well) include librarians who are uncomfortable with computerized reference, and who, for one reason or another, simply refuse to make appropriate use of the technology. They exhibit a "subjective stress" that "leads to affective states such as anxiety, hostility, and depression and to decrements in aspects of job performance" (Motowidlo et al., 1986, p. 618. See also Jackson et al., 1986).

Despite any librarian resistance, however, library users are increasingly enthusiastic about machines, with a consequent increase in the amount of help which they need and which librarians render, both at and near the reference desk. Equipment maintenance and troubleshooting exacerbate this stress factor. It is clearly desirable for someone to extend the research of Smith and Nielsen, and of Maslach, Jackson, Motowidlo, and others who have studied stress and burnout in groups such as nurses and teachers, and investigate not only the general phenomenon of reference burnout but also the place that computerized reference tools have in the hierarchy of stressors affecting reference librarians. The ultimate goal would be to develop mechanisms which could defuse computerized reference service as a stress-related issue for some reference librarians.

INHIBITORY FACTORS

Cost

Many factors enter into the process of retarding a more meaningful integration of automation and end user involvement with automation into the reference function. The chief one continues to be cost. Automation generally entails costs which libraries find difficult to bear. Hardware, software, telecommunications, and maintenance costs are budgetary items over and above the traditional personnel, operating, and materials costs. While such costs are slowly being factored into library budgets, they are still beyond the means of smaller libraries, and they eat into a finite pie of resources of even the largest libraries at a time when most find it difficult to maintain enough money for traditional expenditures. As a result, many libraries have not taken advantage of desirable new technologies.

Security

In some cases, automation involves the handling of a paper print-out which can be treated like traditional library material, or the examination of a screen of data which cannot be tampered with. But in many other cases automation involves the handling not only of computer hardware but also of floppy discs and laser discs. This introduces numerous opportunities for mayhem which have inhibited the acquisition of some tools and the use of others. Libraries experience the same kinds of problems with automated reference tools which they have previously experienced and been unable to come to grips with in terms of multimedia educational resources.

Materials kept on reserve or in locked or secure areas are not as useful or as highly-used as materials which are freely available. Stolen discs render hardware useless, and microcomputers subverted to personal or malicious use render library software and information resources useless. Vendors and database creators have been slow to recognize such problems. At this writing, the need for a "jukebox" to provide control of and multiple access to laser discs has been recognized but not yet totally resolved.

Instruction, Staff Time, and Standardization

Some years ago most reference librarians assumed that the introduction of automated reference resources would mean a diminution of the need for labor-intensive instruction. It is now apparent that for the most part the opposite is true. Nearly every automated reference tool differs from every other, standardization of format and search languages is almost nonexistent, and the nature of automated access entails a merciless propensity to yield no search results, regardless of the brilliance of the search strategy, if there is the slightest spelling or logical error. Machines also tend to need constant attention in a way that books

do not; systems need to be rebooted; printers restocked with paper; and users guided continually in the idiosyncrasies of what, in broad terms, are relatively simple systems to use.

As a result of these factors, automation of reference may not always save librarians appreciable amounts of time, although it has undoubtedly made their work more effective in many cases. Its effect on bibliographic instruction has resulted in the promotion and use of new modes of instruction, such as computer-assisted instruction and compact disc interactive technology. New questions about instructional strategies and a new "curriculum" of instructional content areas are also being raised. More recent is the movement in academic libraries to design and teach courses in information literacy. There is some relief from ineffective, labor-intensive orientation tours, where institutions use microcomputer-based or mainframe programs which contain floor space plans and orientation information. But mostly there is an increased need for instruction in the use of online and on disk systems which vendors tout as being transparent, and constant need to instruct users about the place of databases in a research strategy—i.e., a single database does not an entire search strategy make. Some librarians worry that the easy availability of such databases, in online or disc form, actually narrows rather than widens many a patron's options if they restrict themselves to what can be gleaned quickly and easily through the nearest automated information resource.

END USER SEARCHING SUCCESS AND SATISFACTION

The notion that end users should do their own searching and should be taught to do so by librarians has been a controversial one in the literature. There is a large body of material on the topic, primarily concerning efforts to instruct end users, assess user satisfaction, and report on the success of end user searches compared to intermediary searches. One longitudinal study over eleven years compared MEDLINE transaction logs of several groups—faculty, graduate students, and a mixture of staff from a school of pharmacy and a department of pathology. Its findings reveal that the convenience of terminal location affected use, that convenience of doing online searches was more important to end users than the quality of search results, and that end users prefer to learn from a colleague, by trial and error, or (lastly) one-on-one from a search intermediary (Sewell & Teitelbaum, 1986). Peischl and Montgomery (1986) analyze some of this research and conclude that, for most types of users, the responsibility for quality searches rests with the library, because infrequent or disinterested users do not perform effective searches. Even in the corporate environment, where end users do more online searching and perhaps have more incentive to be conscientious, intermediary librarians are of value to the searcher (Peischl & Montgomery, 1986, p. 349). Perhaps what can be gleaned from the research on end user searching is that users' library research behavior

can be affected by end user searching; that there are many libraries that have had a fair amount of success in teaching end users; that end users value the service more for its convenience than for the quality of the results; and that most librarians feel that the best situation for high-quality, cost-effective retrieval is a team effort search by a librarian-intermediary with an end user present. With the increasing use of optical disc services, however, the proportion of searches during which a librarian-intermediary is likely to be present will decrease, and the onus for high-quality searching will fall more and more on the database and search-software producers, and, of course, on the end users themselves.

CONCLUSION

The existence of online catalogs and the availability of other automation products in libraries have raised user expectations and appetites. There will likely be increasing public pressure on libraries to provide such products for public use, even as librarians who would like to do so worry about both costs and the pedagogical wisdom of making such products available, especially in an unmediated environment. The effects of the computerized reference environment on librarians are great. Many authors describe an enhanced role with more prestige associated with automated information retrieval skills, and some other writers draw attention to the increased work load and pressure on reference librarians to acquire a subject specialization and learn a variety of online and on disc search protocols. A few even proclaim the loss of prestige and function as the role of the online search intermediary is consumed by the independent end user of online search services. And still others describe future scenarios with reference librarians as information access and retrieval consultants.

Whatever the new generation of technology may be, the essential questions for librarians will probably remain the same. Do we push ahead or react conservatively? Do we stress end-use or mediation? Do we teach or try to remain uninvolved? Are we instructors with an important proactive role, acting as consultants to our clientele, or are we CD-ROM disc jockeys slinging whatever technology is current? How do we find the resources to be innovative and take advantage of automated reference tools while continuing to support "traditional" or "basic" services? Are we up to the challenge posed by our own innovation?

Perhaps the most candid answer available at the moment is that both librarians and end users are on a technology express, and the stops have yet to be announced. We know only that new technologies in reference increase the need for acquisition of new skills and continuing education on our part; that they provide the potential for better service to the public if properly harnessed; that users have more control now of their information searching and have additional high tech choices; and that this progress brings with it a variety of problems not only in terms

of money, space, and security but also in terms of choices we have to make concerning our own role in the reference process. We have no choice but to tackle these challenges and resolve them as they occur, for the benefit both of the users and of our own profession.

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