Information Technology and Libraries

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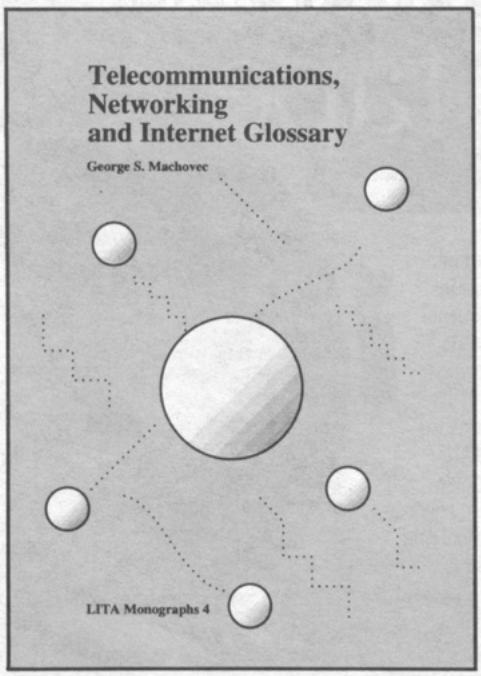
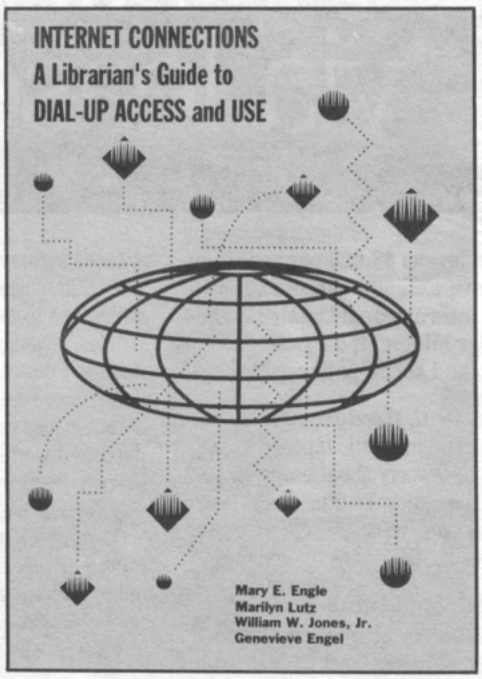


Telecommunications, Networking and Internet Glossary, by George S. Machovec. (LITA Monographs No. 4) 106p. pbk. ISBN 0-8389-7697-2 $18.00

Developed to assist librarians, information managers, and students in remaining current with the constantly increasing amount of new terminology in the high-growth communications field, this new glossary from CARL (Colorado Alliance of Research Libraries) technical coordinator George S. Machovec provides hundreds of definitions to telecommunications, networking and internet terms that frequently appear in library automation technology. A handy reference for today's librarian.



Internet Connections: A Librarian's Guide to Dial-Up Access and Use, by Mary E. Engle, et al. 166p. pbk. ISBN 0-8389-7677-8 $22.00

This guide is for librarians and library patrons who are not already members of the Internet family of users. It is a snapshot of the networking services available at the time of publication, a discussion of the concepts and terms in use, and a bibliography of the notable guides that document the search techniques, navigational tools, and information resources available. It is designed to help you get started right away.

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Editorial

Thomas W. Leonhardt

Library Card Sign-up Month 1994

The American Library Association is asking editors of its journals to run a canned editorial touting September as Library Card Sign-up Month 1994. As this editorial is being written it is already September, and this issue of the journal won't appear until December of this year. I have decided not to run the canned editorial. Then why bother to mention something that will be history when attention is drawn to it? Why, indeed! I have canned my own editorial and have given my readers an extension. I have declared December to be ITAL Library Card Sign-up Month 1994.

My colleague Gloriana St. Clair, who edits *College & Research Libraries*, has divided librarians into two camps, the Equilibrist camp, where librarians are convinced that the status quo will remain undisturbed, and the Alarmist camp, where librarians are convinced that we are on a precipice of change and that unless we are wearing a parachute or a bunjee cord, we will fall over the edge of change and be eternally lost, ourselves a bit of history.

For true debate it is essential to have two clear issues so that a winner can be declared (and I am not referring to the political posturing that is called debating by the participants and the news people who have bought into such farces). In a true debate, one side wants to out-research the other and wants to use perfect logic and impassioned rhetoric to convince the judges that there is more evidence or reason to support one side than the other.

When all is said and done, however, a reasonable person presented with such black-and-white evidence must undoubtedly begin to see gray. The less one knows about something, the easier it is to be swayed by emotions, the easier it is to see one side as right, the other wrong.

The debate in the library world often uses the book as the center of the arguments on both sides—the book is doomed and will be replaced by a CD player by the year 2000—the book has been around for 550 years and will be around another 550 years.

Another argument pits the library as place against the virtual library. It seems that many arguing against the library as a place haven't been inside one in years, if ever. Or they work there and see possibilities of working at home if only . . . .

As an academic librarian who uses both the university library and the public library, I can see where these arguments are starting from. I don't see where they are going.

Technology allows me to reserve the latest best-seller right from my home. I can even see how many people are in line ahead of me to get the book. And I can see which books are checked out and how much money I owe in overdue book fines. My public library gives me a lot of leeway, by the way, being a yes-saying library. So, contrary to the ALA pitch, you can generate a monthly bill with your library card but only if you forget what day it is.

When I go to retrieve my electronically reserved book, after a computer has called my home and left a message, I invariably browse the new book shelves and probably go over to the mystery section, too. I will leave with four or five or more books as a result of browsing.

As I leave, I notice that even on weekends (we still have weekend service at our public library), the meeting rooms are busy. I see the sign reminding me that I need to change my voter registration, and within five minutes it is done, right at the desk where I got my library card.

Why bother? Why get a library card? Because I enjoy reading. I also enjoy visiting the library and seeing how it has become the community center. An informed community recognizes that centrality and supports it in every way possible.

Yes, libraries are changing, but so is the world around them. Technology is serving libraries well, but it may be driving changes in our libraries and our world less than we give it credit for. It may just be that technology is allowing us cope with the changing world in ways that allow us to keep up.

Heraclitus based a philosophy on his observation that the world is in a constant state of flux. Change occurs faster now than ever before, at least in the software world, but fundamental change is gradual and sometimes leads us in directions that we would not have expected.

Be not an equilibrist or an alarmist. Get that library card (December is not too late) and begin to inform yourselves about the past and the present, and you will be prepared for the future. We know not what it will bring, but most assuredly there will always be a demand for well-read, educated persons who can think and write well.

The Future of Scientific Journals: Lessons from the Past

Ann C. Schaffner

New technologies will soon bring fundamental changes to the process of scientific communication. To understand the path that these changes may take in the future, we need to take a careful look at the past. By examining the history of scientific communication, we can see how new technologies can interact with changes in communication forms. By looking at the complex roles that journals have traditionally played, we can better understand how and when journals may incorporate these new technologies. From these models we can project that electronic journals must meet the basic needs that print journals do, that they will initially maintain many of the features of traditional print journals, that their transformation may be driven by external forces, and that they will be slow in reaching their full potential.

It is clear to all involved—from the most astute students of electronic publishing to the most casual observers—that we are approaching a time when new information technologies will cause profound and elemental changes in scholarly communication. While these changes will eventually affect communication in all areas of scholarship, the sciences seem likely to be affected first. The scientific community has been receptive to the use of new technologies in everything from genetic sequencing to computer modeling of geological changes. Much of the infrastructure needed to support electronic journals is in place, with widespread availability of individual workstations, networks, and a technologically sophisticated user group. At the same time, other incentives—to decrease publication lags, reduce costs, and incorporate new kinds of data—are growing.

Despite these factors, the preeminent form of scientific communication—the scientific journal—has remained largely impervious to the force of new technologies. Peer-reviewed science journals, presented to readers in an electronic form are still rare. It is true that the internal processing of the texts in science journals has been transformed by automation, yet the final version of these texts shows little evidence of these changes. It is true that bulletin boards and listservs abound on the Internet, yet true electronic journals are far less common, and refereed ones almost nonexistent. Recent estimates indicate that there were 110 scholarly electronic journals in 1991 and 240 in 1993.[1] While the recent rate of growth may seem impressive, the numbers are still low. What are the inhibiting factors that have prevented the full integration of new technologies into the scientific publishing process? What is the prognosis for the future? The answers to these questions may lie as much in the past as in the future.

We frequently have heard comparisons of early electronic publications with early printed works, which retained many of the conventions used in manuscripts. Nevertheless, more detailed analyses of the advent of print technology, the long history of science journals, the sociology of science, and the study of scientific communication have often been ignored in developing projections about the future of science journals. What might be gained by such an examination of the past? First, we gain an understanding of how technologies can interact with new forms of communication and, second, we gain help in determining the essential functions traditionally performed by science journals. Both offer powerful models for understanding what the future may bring.

The Development of the Scientific Journal

The technological innovations essential to the development of the scientific journal were in place long before the journals themselves appeared in the mid seventeenth century. The most important of these, the introduction of print technology in the late fifteenth century, brought a wide range of changes to virtually every area of life. The widespread use of the printing press resulted in many changes in communication forms.[2] Included among these are a number of features of printed communication that we currently take for granted: the use of alphabetical order for organizing information, the title page, regularly numbered pages, punctuation marks, the indexing of individual works, and the ability to cite previously published works. Most of these features evolved from the greater standardization offered by printed works in comparison to manuscripts, which incorporated intentional and unintentional changes each time they were copied. These new features did not appear immediately but developed gradually.

The emergence of an efficient distribution mechanism was perhaps more important to the origin and success of the scientific journal (and to the development of its predecessors, the personal letter, and the non-scientific periodical). A widespread, reliable postal system was introduced throughout much of Europe during the

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late sixteenth century. Even here, there is not a clear and immediate cause and effect relationship between technological change and the development of the journal. David Kronick, in the introduction to his work on the history of the science journal, emphasizes this point, "technology itself had very little impact on the periodical's production and distribution. The processes of printing, paper-making and transportation remained remarkably stable throughout this entire period."[3]

Clearly other forces were at work in the mid seventeenth century when the first scientific journals originated. Primary among these were the profound changes taking place in science itself. It is no accident that the scientific journal arose in the midst of the scientific revolution. One of the principal features of this revolution was the development and acceptance of the experimental method as the norm for scientific investigation. Up to this time, science had largely consisted of debates over the virtues of various classical authorities, and expansions or interpretations of these classics, normally published in book form. With the advent of the scientific revolution, scientists were urged to abandon these "little books of men" and to turn their attention to the "great book of Nature."[4] Direct and structured observation of nature was to become the norm for science for the future.

Gradually the practice of observation was refined, and the experimental method emerged. One of the purposes of the new scientific societies established in the seventeenth century was to sponsor public demonstrations of experiments. At the same time the practice of private correspondence among scientists in Europe served to communicate additional experimental results. The experimental approach called for a reporting of small, discrete units of information, rather than in-depth development of broad topics.[5] This type of report was ideally suited to the format of the letter and later to that of the journal. Eventually private correspondence became institutionalized through the efforts of professional intelligencers such as Henry Oldenburg, who produced the first issue of a scientific journal, the *Philosophical Transactions of the Royal Society of London*, in 1665.[6] Of course journal publication eventually replaced book publication as the primary means of publishing in science, but this was a gradual process.[7]

The full development of the form of the scientific journal was also a slow process. The system of packaging information that resulted from this long evolutionary process continues even now to enhance the ability of journals to communicate effectively. Each journal has its own profile—a combination of focus, community of readers and contributors, and traditions. Based on an assessment of this profile, determined by scanning many titles over an extended period of time, readers determine the value of a particular journal title to their specific interests.[8] Each article, in turn, is presented in a traditional format. This format took close to 150 years to reach a truly mature form[9] and continues to be refined into the present century, with significant changes in the length of articles, the number of references, and in syntax, word choice, and organizational structure.[10] While the resulting structure may be made explicit in section headings and titles, it is often implied only by typography. This typography helps a reader glancing at a journal article to move quickly from one section to another—from abstract to references, back to methodology, etc. In fact, what little evidence we do have about the way people actually read journal articles shows that people do read in this way.[11] In addition, the visual image of the page helps readers to build a mental model that enables them to return quickly to specific sections.[12]

Other features that took years to develop include the structure of citations and the peer review process. The network of citations, which links together the individual pieces of scientific knowledge, was not present in the earliest journals: "Gradually researchers start to recognize the cooperative interlinking of their work . . . Informal and irregular recognitions of debt occur throughout the eighteenth century, and in the nineteenth century modern citation practices start to develop."[13] Peer review, so critical to maintaining quality in journal publication, also evolved slowly. While the foundations of peer review were laid in the earliest days of the *Philosophical Transactions*, the concept was formally initiated in the mid eighteenth century.[14] Only gradually, over the next two hundred years, did scientific journals in a wide variety of fields accept it fully.[15] Even today there are important journals that do not follow this practice.

Functions of Scientific Journals

What do we know of the functions performed by science journals and their development? How can this help us to understand their likely course of evolution in the future? Publishing in printed scientific journals is so thoroughly embedded in the scientific process that it will not be given up easily. Electronic journals must, at the start, at least serve the basic functions that print journals have traditionally served. Once the transition has been made, new technologies may allow us to add new roles, to drop some of the traditional roles, or to fill them in intrinsically different ways.

What are these functions? On this point there is little agreement. Much has been said on this topic in the litera-

tures of the sociology of science, philosophy of science, communication studies, and librarianship. Much of what has been said shows a great deal of cynicism.

While there is much overlap and ambiguity of functions, I would propose a model which includes the following functions, in order of importance:

- Building a collective knowledge base
- Communicating information
- Validating the quality of research
- Distributing rewards
- Building scientific communities[16]

Building a Knowledge Base

If we look at statements of scientists themselves from reminiscences and interviews, we find the frequently stated opinion that journals serve the most basic of all functions in science—the creation of published knowledge. The importance of research to the scientist is obvious, "Research as an activity comes to be 'natural' for [scientists]: they find it self-evident that persons should be excited by discoveries, intensely interested in the detailed working of nature, and committed to the elaboration of theories that are of no use whatever in daily life."[17] Less obvious, perhaps, is the relationship of publication to this central function of research. The job of the scientist is not only to produce knowledge, but to make it publicly available. Some observers even say that it is publication itself, not research, which is central to the scientific process,[18] that research is not complete until published,[19] or that scientific knowledge is defined by being published.[20] In informal conversations with scientists, this author has heard comments to the effect that scientific knowledge does not really exist unless it has been published. Suffice it to say that contributing to public knowledge is an essential function of science and that the central role of science journals is to create this collective knowledge base. In order to fulfill this role, journals must maintain scientific knowledge in a stable form that is publicly available and has the confidence of the scientific community.

While scientists do write in the hope that their contributions will be read, this is really less important than contributing to the public record. Current readers are desired, but future, or latent, readers may also be important. No one has stated this better than Johannes Kepler (though he was referring to a book and not an article), when he wrote, "I am writing a book either for my contemporaries or for posterity. It is all the same to me. It may wait a hundred years for a reader, since God has also waited six thousand years for a witness."[21] Clearly the function of contributing to a knowledge base serves the needs of authors as much as those of readers.

While the testimonials to this effect are numerous, this evidence is only anecdotal or philosophical. What harder evidence, if any, do we have of the importance of this role? Some evidence can be found in the standards for publication in the sciences as opposed to the standards in other areas of scholarship. Harriet Zuckerman and Robert Merton, in a major study of peer review, showed that the rejection rates in science journals were significantly lower than those in the humanities and the social sciences.[22] This can be interpreted as evidence of the tendency within science to publish work that meets some minimum criteria of accuracy and correctness in order to guarantee the construction of a complete knowledge base. As Zuckerman and Merton stated it, the editors of science journals prefer "occasionally to publish papers that do not measure up rather than to overlook work that may turn out to be original and significant."[23] While rejection rates may have grown in more recent years, it appears that the differences among disciplines have been maintained.[24]

Communicating Information

What of the reader in this model and the role of communication? Does it matter if anyone actually reads the individual articles that make up this knowledge base? Certainly most scientists publish with the expectation that their work will be read, confirmed, praised, cited, analyzed, and commented on in future works. This is how an individual work can become an integral part of the collective knowledge base. In this way, the functions of building a knowledge base and communicating information are intrinsically linked. Bruno Latour and Steve Woolgar, who studied a group of biomedical researchers using participant-observer techniques, noted, "Thus members of our laboratory regularly noticed how their own assertions were rejected, borrowed, quoted, ignored, confirmed, or dissolved by others. Some laboratories were seen to be engaged in the frequent manipulation of statements while elsewhere there was thought to be little activity. Some groups produce almost at a loss: they talk and publish, but no one operates on their statements."[25]

It is true that science journals, in their earliest years, did provide for interaction, or give and take on the part of active researchers. Perhaps the most famous example of this is the case of Newton's theories on optics. The resulting debate in the journal literature was so unpleasant that Newton became embittered and refused to publish in journals for the remainder of his career.[26] In this area journals have become increasingly dysfunctional in recent years as lag times in publication have increased.[27]

What of the importance of informal communication? The cynical viewpoint holds that most of the meaningful scientific communication takes place informally, and that journals are redundant, useful only for procuring tenure and grants.

> It used to be that scientists learned about what their colleagues did by reading the journals. Actually they used to read books, then things moved so fast they read only papers, then even faster so they read only letters to the editor in the rapid publication journals. Now they are moving so fast that they do not read but telephone each other, and meet at society meetings and conferences, preferably in beautiful hotels in elegant towns around the world. They get by in what are now called 'invisible colleges' of little groups of peers . . . . These groups are very efficient for their purpose, and somewhere along the line, people eventually write up their work so that graduate students can read it and get to the research front. By the time it gets published, however, it is so old that all the good research juice has been squeezed out of it.[28]

A number of studies over the years have looked at communication and information-seeking behaviors of both scientists and engineers. Virtually all have shown the significance of informal communication.[29] For our purposes, we need to highlight only a few of these. In 1961–1964, the American Psychological Association (APA) sponsored a ground-breaking research project, conducted by William Garvey and Belver Griffith, that outlined the linear process followed by a typical research project.[30] It showed that the formal publication of research results accounted for only a small percent of the information communicated and that the first formal report normally followed the inception of a research project by at least 18 months. More specifically, more than half of the reports in core journals would be read by less than 1% of a random sample of psychologists and no research report was likely to be read by more than 7%.[31] On the other hand, 40% of authors distributed preprints and 62% distributed reprints after publication.[32] In the late 1960s Thomas Allen, using interviews, surveys, and diaries, studied the information seeking behavior of 33 engineering research groups working on 17 research projects. This study showed that informal sources accounted for 55% of the information seeking events and 74% of the time spent in information-seeking.[33] Diana Crane in her work *Invisible Colleges* demonstrated the importance of the informal social organization within a discipline in transmitting knowledge.[34] More recent data comes from such sources as the study reported at the 1991 Faxon Institute that surveyed 680 scientists working in the areas of chemistry, genetics, and computer science, and Jan Olsen's 1992 study of 46 chemists, sociologists, and humanists in two different institutions. The Faxon study showed that journals were ranked as the source used most frequently, but that consultations with colleagues were ranked next in frequency of use.[35]

It should be noted that electronic publication has already had a major impact on the conduct of this informal component of scientific communication.

> On the brink of intellectual perestroika is that vast prepublication phase of scientific inquiry . . . it has now become possible to do all of this in a remarkable new way that is not only incomparably more thorough and systematic in its distribution, potentially global in scale and almost instantaneous in speed, but so unprecedentedly interactive that it will substantially restructure the pursuit of knowledge.[36]

If we look more closely at the literature on informal communication, several important points emerge. First, the amount of informal communication and its importance vary enormously from discipline to discipline. Second, its distribution is limited to a small circle of associates. Third, much of the highly-touted informal communication is actually about the formal literature. Finally, informal communication is qualitatively different from formal communication. Let's look at each of these briefly.

It is clear that the importance of informal communication varies widely from discipline to discipline. Several studies, from Allen's to the Faxon study have emphasized the greater reliance on informal communication by the engineering disciplines as opposed to the scientific disciplines.[37] Further details are provided in a study by Belver Griffith and A. James Miller that examined the characteristics of disciplines likely to rely heavily on informal communication:

> High degrees of communication and organization are associated with: (a) a limited number of institutions having research facilities; (b) a single specialized organization containing most researchers in the field; (c) many student-teacher relationships, especially if most researchers have been trained by a single individual; (d) long term commitments to research in the area; and (e) the area being the principal research interest of most researchers involved.[38]

It is also clear that informal communication is restricted to a relatively small group—although the advent of the Internet has certainly made significant changes in this area.[39] Traditional preprint distribution is limited to a few individuals—the APA study showed that on the average authors distributed only 10 preprints.[40] Crane's and Allen's studies showed a relatively small number of people in any discipline that are active in informal communication.[41] The cynical viewpoint is represented in this case by N. David Mermin's fictional character Prof. W. A. Mozart, who described this aspect

of informal communication as "the undemocratic monopolization of cutting edge science by self-selected cliques through the proliferation of preprints as the primary publication procedure."[42]

Perhaps the most interesting finding of the studies of informal communication is that much of this communication is actually about the formal literature. Several studies have shown that in most organizations there are central people who are well acquainted with the literature and serve as important sources of information for others. Allen termed these people "information gatekeepers"[43] while the APA report used the term (somewhat outmoded and sexist) of "information man."[44] The APA report also gives us the concrete information that 13% of readers of any article will tell a colleague about the article.[45] This practice is, of course, institutionalized in the tradition of the "journal club," where faculty and graduate students meet on a regular basis to report on the literature.

Finally, it is clear that formal communication differs in important qualitative ways from informal. Even Richard Feynman, notoriously reluctant to publish his results, acknowledged in his Nobel Prize acceptance speech the difference between a formal publication and the informal communications which precede it: "We have a habit in writing articles published in scientific journals to make the work as finished as possible, to cover up all the tracks, to not worry about the blind alleys or to describe how you had the wrong idea first."[46] In a world in which researchers are barraged by information from all fronts, the process of selection and editing (including self-selection and editing by authors), peer review, and revision that go into the production of a formal journal article provide important filters for readers.

In fact, while studies show that informal communication is important, it appears that the art of reading and browsing journal articles is not yet dead. Olsen's 1992 study showed that chemists still relied heavily on the journal literature, with all respondents using journals at least once a week and more than half using them daily.[47] All the chemists browsed current issues of journals while fewer conducted more focused searches of the literature.[48] A 1990 Elsevier-sponsored study of 550 scientists worldwide showed that 50% browsed journals in their area of expertise weekly, and that 33% browsed on a regular, if less frequent, basis.[49]

Validating Quality

The role of the journal in validating the quality of research is related to the qualitative difference in formal and informal communications. Certainly researchers do not choose to publish formally everything they may report informally. Of the work that is published in less formal, complete form, as in letters journals, not all is brought to full fruition in a more formal report. One study showed that of all the reports published in *Physical Review Letters*, only 50% later appeared as full journal reports.[50]

What of the peer review process? If the rejection rates are so low, does it mean that the system for maintaining quality is not functioning? The evidence does not point in this direction. First, authors have to a large degree adopted the standards of the reviewers, exercising their own controls.

> The experienced professional scientist seldom comes into conflict with the referees of his papers, not because he belongs to an inner conspiracy of mutual admiration but because . . . he has internalized the standards that the referee is trying to enforce and has already anticipated most reasonable grounds for criticism; in other words, he has already learnt to drive with due care and attention.[51]

Second, even when papers are accepted, the reviewers may suggest substantive (or stylistic) changes that need to be made. In some cases, reviewers catch important errors, as this scientist, interviewed by Warren Hagstrom, confesses, "A couple of times reviewers for the journals challenged my papers. In one case the reviewer was completely wrong, in the other case I was completely wrong . . . . In the latter case I was completely wrong and thankful to the reviewer."[52] For this reason, it may actually be dangerous for scientists to participate in unreviewed journals or events.

In recent years many have challenged the ability of journals to maintain quality in the face of increasing accounts of fraud and error. The scientific community, under heavy criticism from the public and the highest levels of government, has claimed that the practice of peer review prevents widespread fraud and deception. On the other hand, the increasing number of highly-publicized cases of fraud have made it clear that the system is failing in some important ways. As science has become more competitive in recent decades, the pressures on scientists to create fraudulent data have increased. At the same time, as science becomes increasingly fragmented, it becomes more difficult to find qualified reviewers. Reviewers often do not have the skills or take the time to double check the details of all reported results. In fact, while peer review can monitor accuracy and quality to a certain extent, the scientific community has always relied on a great deal of self-policing to control fraud. The entire system of peer review, based on a delicately-balanced combination of trust and volunteer labor, may be on the way to becoming dys-

functional, yet no new methods are readily apparent at this time.[53]

Distributing Rewards—Priority, Recognition, Tenure, and Grants

What of the role of journal publication in securing rewards—be they tenure, grants, or simply recognition? Again, there is a cynical viewpoint, this time expressed by Harold Wooster.

> It turns out that the real problem is not in substituting for journal publication, which is a fairly simple technical matter, but in substituting for the prestige arising from journal publication, which is something else again. I have occasionally proposed that this problem could be solved by authorizing the central computer to issue Brownie points which by universal academic convention would be fully substitutable for items in personal bibliographies.[54]

Journals do serve to establish priority in research, and the protection of such priority claims is important to researchers. One of the ironies of the origins of the science journal is that the development of a system to safeguard claims of priority was a prerequisite for making the publication of results in the scientific journal possible. Prior to the appearance of the journal, scientists and technicians alike had carefully guarded their secrets until their claim to priority was well established and any significant material gains had been realized. With Oldenburg's establishment of the *Philosophical Transactions*, a public means of certifying priority in science was established.

> Oldenburg's correspondents understood that the contents of their letters were likely to be read or summarized at the society's meetings and that abstracts of them would be entered in its register. This provided a means for establishing priority in scientific discovery, which, along with the recognition and status conferred by the leading scientific society in Europe, induced many natural philosophers to accept the new norm of free communication of scientific information.[55]

W. Hagstrom, in his work *The Scientific Community*, has examined the importance of priority and recognition in some detail. Hagstrom's basic thesis is that scientists produce publications as gifts to the community in exchange for the rewards of recognition and acknowledgment. However, the rewards go only to those who are first. "The system of incentives in science does not encourage workers to devote their efforts to repeating past accomplishments when the record of such accomplishments is available in libraries."[56] At the same time Hagstrom argues against the importance of the rewards of money and position.

> It is alleged that scientists publish, select problems, and select methods in order to maximize these rewards. University policies that base advancement and salary on quantity of publication sometimes seem to imply that this is true, that scientists' research contributions are not freely given gifts at all but are, instead, services in return for salary . . . an explanation of scientific behavior in terms of extrinsic rewards is weakened by the fact that many scientists in elite positions, whose extrinsic rewards will be unaffected by their behavior, continue to be highly productive and to conform to scientific goals and norms.[57]

By at least one measure—the competition for certain federal grants—it does appear that science in the U.S. has become more competitive in the decades since Hagstrom's work was published.[58] Most contemporary observers emphasize importance of the extrinsic rewards of grants and positions. "The reward system for scholars and scientists depends for now on traditional publication as a defining criterion for rank and status, with the real compensation for publication coming not from sales of the material itself but from the advancement in rank, salary, and prestige that publication makes possible."[59] One useful way of viewing this issue is provided by Latour, who outlines a "cycle of credibility" in which prestige, recognition, positions, and grants are intrinsically linked together.[60]

Building Scientific Communities

Finally journals often serve to cement together a group of researchers, an invisible college, in many ways. "The very existence of a journal implies a degree of sociability amongst those who subscribe to it. The hallmark of a new discipline is the establishment of a specialized journal catering to the scholarly needs of its exponents. It constitutes an act of solidarity and sodality, and polarizes the subject around it."[61] The introductory pages to the first issue of a journal or the promotional material for it often explicitly discuss this function. Thus in the introductory remarks to Vol. 1 of *Cognitive Science*, the editor explains, "Recently there has begun to grow a community of people from different disciplines, who find themselves tackling a common set of problems in natural and artificial intelligence . . . . The work of these researchers is converging toward a coherent point of view that is different from the focus of any of the current journals."[62] As such, the journal takes its place with other manifestations of group spirit found in meetings, conferences, and retreats, and, now, via electronic bulletin boards.

Conclusions

What are the lessons to be learned from this examination of the development of the scientific journal and its essential functions?

- Enabling technologies may not be sufficient to bring about major changes in communication forms. Technology had little to do with the origins of the scientific journal. It was the changes in science itself that drove the development of this new form of communication. At the present time new information technologies are at hand, and an efficient delivery mechanism is now available in the Internet. Nevertheless, it is the external changes, the changes in science itself, or aspects of the current system that are becoming dysfunctional, which may finally bring about the shift to electronics. Electronic journals that can make papers available immediately after peer review, that can eliminate backlogs, that can recapture some of the interactive qualities of early journals, or that can allow researchers to present new computer simulations will have an enormous appeal.
- New forms of communication are slow to develop and to take full advantage of new capabilities. The fully mature forms of journal articles and printed books took years to develop. We should expect the same from electronic journals. While the electronic journal of the future may bring exciting new features and capabilities and may dramatically change the way we interact with information, we should not expect it to appear full-blown overnight. We can envision an electronic journal that will allow us to incorporate hypertext links within documents and among different documents. We can imagine a journal that will incorporate video and sound. We can look forward to transferring a mathematical equation from a journal article to a local system and manipulating it or taking an algorithm from a journal and animating it. We might even expect the journal of the future to seek out its audience rather than vice versa. All of these features, and many more, will probably be part of the journal of the future. However, we should expect the earliest electronic journals to mimic their printed ancestors much more closely, just as the earliest books resembled manuscripts and the earliest scientific journals resembled personal letters. Once the user community has embraced electronic journals in a more familiar form, more advanced features may begin to become available. This will probably occur only after a lengthy and somewhat painful period of experimentation when we will have to deal with a multiplicity of forms and interfaces.
- Authors must have confidence in electronic journals' ability to serve as public knowledge. This central function of journals is thoroughly embedded in the scientific process and will not be given up easily. The peer review process and the validation of quality must be maintained. This may prove to be a difficult hurdle for electronic journals to overcome, because of their association with other forms of non-refereed publications presently distributed over the Internet. After an initial infatuation with the variety of information resources available on the Internet, many scholars are becoming disenchanted with the quality of much of this material.[63] True refereed electronic journals, while they will probably be distributed on the network, will need to disassociate themselves from many of the electronic bulletin boards currently available. At the outset, for these reasons, most successful electronic journals will probably be electronic versions of existing print journals that researchers already know and respect.

  Scholars must also be convinced of the permanence and stability of electronic journals. They must feel that their contributions will remain through the ages, available to potential readers, and that these contributions will be protected from corruption, intentional or unintentional. They must also feel that the results of their research are publicly available, and not accessible only by a small elite.
- The information content carried in the structure of the current system must not be lost (at least until technology can provide alternatives). The grouping of articles into discrete journal titles with distinctive identities, and the format of individual articles, add structure and meaning to the body of scientific knowledge in subtle ways that are not yet thoroughly understood.[64] Electronic journals will need to maintain many of these structural elements. We cannot expect massive new databases of individual articles to be useful; journal titles will need to be maintained. We cannot expect readers to page through screens of plain ASCII text stripped bare of structure and of much of its meaning. The structure of documents serves to orient readers; readers must be able to move from one section of article to another easily, and they must be able to locate and re-read sections efficiently. For these reasons, page images, including graphics and typography, must be recreated on screen. This will be expensive and slow, and such images will need to be displayed on large-screen graphics

terminals. These factors will limit the speed at which electronic journals will be fully accepted. Over the long run advances in technology, bringing totally new forms of searching, displaying, and linking information, may allow us to relinquish of some of these structural elements. Our whole way of viewing and interacting with information may someday undergo changes at the most essential level, permitting dramatically new forms to evolve.

- Electronic journals must be able to serve the social needs of sub-disciplines of scholars. The track record for electronic publications is already good in this respect. New communities are being built and maintained constantly on the networks. There is some chance that this function of journals may be taken over by the more informal publications already available on the networks.

The future of electronic journals will hinge on many additional factors that have not been touched on here, such as economics and copyright. Nevertheless, unless electronic journals can meet the most basic needs of researchers and readers that have been satisfied by print journals for almost 350 years, they will not be successful. When and how they will be able to do so is still an open question.

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The People Speak: The Dispersion and Impact of Technology in American Libraries

Robert Hauptman
and Carol L. Anderson

What is the status of technological applications in American libraries? How much "technology" do most libraries of all types and sizes really have? Does the literature, which delineates many success stories, accurately represent the status of implementations? What technological challenges are faced by practioners in the field—people who work in underfunded and understaffed libraries and spend each day trying to deliver the best service possible given their resources? How close are libraries in the United States to reaching their technological goals for delivering information services to users? Does every library have everything it needs? What are the problems and the challenges presented by technological applications? These are the questions posed in the authors' survey discussed below, and the picture that emerges is most interesting.

Recent Surveys

During the twentieth century, technology has played an increasingly influential role in the dissemination of information. Early microfilm collections and automated circulation systems have given way to OPACs and CD-ROMs, which in turn will evolve or be replaced by more sophisticated innovations. Large academic and research facilities are now almost entirely dependent on technology, but even small special and public libraries can hardly function without computers, modems, CD-ROM readers, fax machines, and other equipment.

In the late 1980s, a number of surveys investigated the dispersion and utilization of technological applications in libraries and information centers. In the spring of 1989, for example, John Berry discovered that based on a survey of 2,000 *Library Journal* subscribers (with 1,003 responding), "more than 60 percent of the facilities either have an integrated system or will buy one within two years." Circulation followed by automatic cataloging are the modules most frequently cited. Berry notes that "more than 86 percent" of the respondents have microcomputers, which are used in many ways, but especially for word processing. The most interesting finding is that many institutions have had to upgrade their systems, often not long after the initial installation.[1]

A 1989 survey of 294 OCLC facilities shows that 97% use microcomputers, a "tenfold increase" since 1983. A similar change is indicated for compact disk usage: a rate of 6% in 1986, when on average each library had but one product, to 66% by 1989, when the total had increased to five products. *InfoTrac, ERIC, Psychological Abstracts, Books in Print,* and *Academic Index* are the top five items used. Finally, 52% of these libraries use fax machines, primarily for ILL transmissions. [2]

A series of 1987, 1988, and 1989 surveys of 16,547 American and European libraries, with return rates varying from 20% to 44%, shows that about half of the American and only 9.5% of the European institutions use optical products. Although the important American CD-ROM materials are used in Europe, none of the European items, e.g., *Myriade* or *Verzeichnis lieferbarer Bücher,* are used in the United States.[3] This is a detailed report and it deserves further scrutiny.

In August 1989, the Special Libraries Association surveyed its 10,695 members. The study was designed to assess the current status and impact of technology, project short term technological requirements of the membership, and help plot future directions for developing technological tools and applications. Four thousand one-hundred sixteen individuals returned the survey, a response rate of 38.4%. Of the 33 technological uses, word processing was cited most often (88.7%), followed by online searching (87.3%), fax (72.8%), and telecommunications software (70.3%). Only 33% of the respondents use CD-ROM products. The application of technologies was perceived by 88.9% to increase the level of service provided, and 75.9% of the respondents perceived a greater level of user satisfaction as a result of technological applications within their operations. A strong majority, 86.4%, indicated an increased level of job satisfaction due to new technologies.[4]

We conclude this brief overview by citing two predictive reports. First is the 1987/1988 Delphi study that projects the dispersion of information technology in 1996 and 2010 in Finland. The goal of the research was assessment and summarization of the opinions of experts assembled to discuss information technology developments and applications in Finnish libraries and information services. The 32 experts' opinions are summarized in table 1.[5]

Robert Hauptman is Reference Librarian, St. Cloud State University, Minnesota. **Carol L. Anderson** is Reference Librarian, University of Albany, New York. The authors are grateful to the following St. Cloud State University personnel: Dean John Berling, for his support of survey research; Catherine Walz, for her perceptive and industrious work on the survey instrument and subject selection; and Mary Woelfel and Susan Klein, for their tireless efforts in getting the massive mailing out. We appreciate the help of those persons around the country who took the time to respond to the survey.

Table 1
Summary of the Predictions

		Use as Service (% of the Total Use)	Use as Self-Service (% of the Total Use)	Rank Order
1. Online searching in databanks containing factual information such as statistical, legal, economy, etc.	in 1996	36	64	1st
	in 2010	22	78	2nd
2. Reading and browsing electronic professional journals for work-related information gathering.	in 1996	11	89	6th
	in 2010	7	93	6th
3. Merging data from external databases with data from one's own organization and using it as one single source.	in 1996	25	75	3rd
	in 2010	16	84	4th
4. Utilization of an online searchable local multimedia system, such as cassette or optical disc, containing data textual material, pictures (also moving pictures) and sound.	in 1996	20	80	9th
	in 2010	12	88	7th
5. Utilization of the telefax equipment with the transfer rate of at least 50 pages per second and the capability to send whole publications (books, journals) without advance copying.	in 1996	49	51	7th
	in 2010	27	73	9th
6. Use of the ISDN—Integrated Services Digital Network, i.e., broadband network with e.g., moving picture capability.	in 1996	15	85	4th
	in 2010	7	93	1st
7. Utilization of electronic mail for communication, correspondence, and materials requisitions from abroad.	in 1996	20	80	2nd
	in 2010	14	86	5th
8. Participation in computer and teleconferences.	in 1996	7	93	8th
	in 2010	4	96	8th
9. Utilization of a wireless, portable workstation for searching in remote databases and for communication with the work place during travel, attendance at meetings and conferences, etc.	in 1996	0	100	10th
	in 2010	0	100	10th
10. Utilization of computerized guidance systems with built-in expert systems to replace user education, guides, and manuals.	in 1996	6	94	5th
	in 2010	3	97	3rd

The Finnish experts believe the general trend is towards self-service by users. They envisage a workstation equipped for multiple functions, though the basic machine will change as local area networks provide support formerly resident on individual stations. A brief summary of some of the other projections follows: faxes may replace much "regular" mail, but they will not replace electronic mail; if videotex is to grow, the retrieval system must be more user-friendly; electronically disseminated information will co-exist with print: regularly published journals will still be printed, but small circulation journals will more often select the electronic publication option; the most important technical changes will occur in the field of intelligent software; and the study concludes that "Most technological applications needed for effective information acquisition, processing, storage, and transfer are either already available or technically realisable in the future." [6]

The second predictive report, *The Twenty-First Century* (1988), codifies the results of a 150-question instrument completed by 224 respondents from a sample of 740, a 30.3% return rate. The following comments merely sample the vast quantity of useful data. More than half of the respondents (57.7%) believe that in the future people will purchase computer-readable information rather than borrow it from libraries. Microfilm will be replaced (according to 76.4% of those who replied). And 81.3% of the respondents believe that external communication mediums, such as interactive television, will not supplant the library.[7]

A New Overview

The present authors decided that an investigation of current attitudes toward technological applications and implementations in various types of libraries would help to answer the questions posed in the introduction to this article. They wanted to know how much "technology" American libraries had and how it was used, the challenges faced by staff and users, and how close libraries are to achieving their technological dreams. They also wanted to determine if the technological success stories in the literature reflected the day-to-day reality in the field. Therefore, in November 1990, they surveyed 800 libraries around the country. It appears that the responses fairly represent the status of technology in American libraries in 1990.

Methodology, Data Collection, and Analysis

Two hundred public, 200 hundred school, 200 special, and 200 college and university libraries randomly selected from the *American Library Directory* were mailed the opinion survey. Of these 800 libraries, 238 responded, for a return rate of 29.7%. Non-respondents were distributed evenly over the four categories.

The survey instrument's 40 questions covered demographics, applications, attitudes, and opinions, and additionally allowed for some open-ended responses. The survey underwent a number of revisions. The data were gathered in November 1990 through a mailed instrument that was returned within three weeks of receipt. The pre-coded questions were tabulated and analyzed at St. Cloud State University's Academic Computer Services using an SPSS-X program. Complete frequencies and a substantial number of cross-tabulations were produced.

Findings

Respondents to the November 1990 survey provide a rather interesting picture of technologies utilized in their libraries. There is a fairly balanced response by library type (see figure 1).

Many of these facilities are quite small: Sixty percent contain fewer than 15,000 volumes, which makes sense since almost half of the respondents represent school and public libraries (see figure 2).

It is somewhat surprising that generally technology is not as widespread as has been hypothesized (see figure 3).

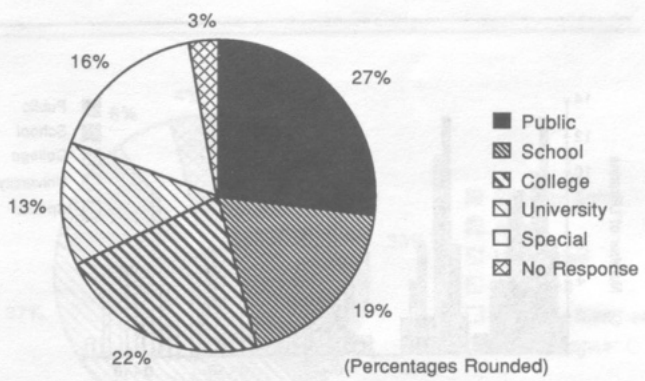

Figure 1
Respondent Breakdown by Type ($N = 238$)

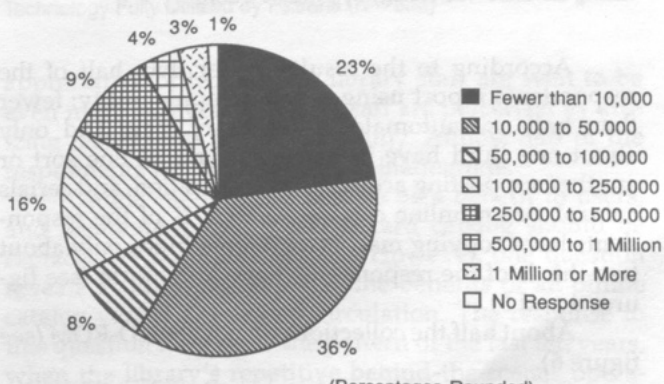

Figure 2
Size of Libraries (In Volumes Held) ($N = 238$)

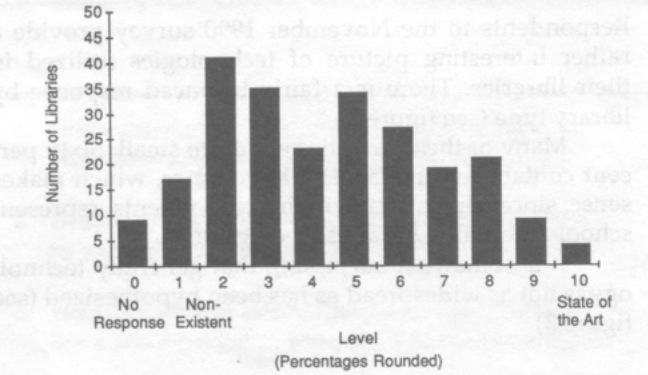

Figure 3
Rating Libraries' Technology ($N = 238$)

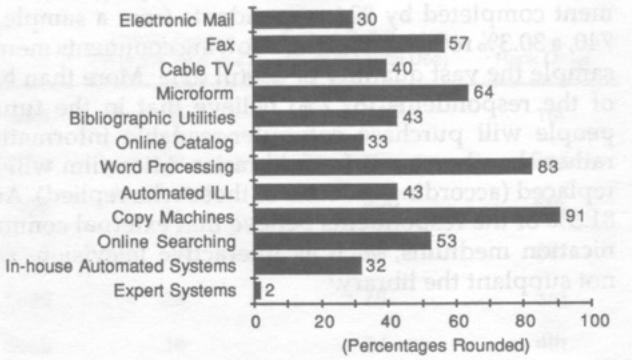

Figure 5
Percentage of Libraries Utilizing a Sampling of Technologies ($N = 238$)

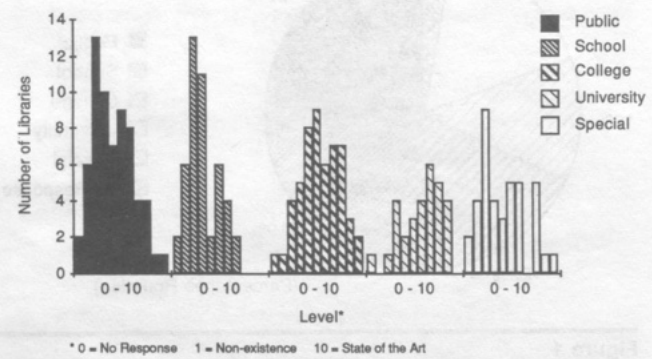

Figure 4
Rating Libraries' Technology by Type ($N = 238$)

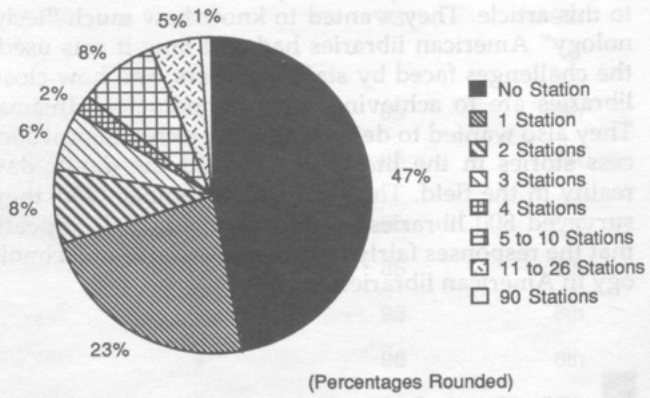

Figure 6
Number of CD-ROM Stations ($N = 238$)

According to the results, fewer than half of the respondents report using a bibliographic utility; fewer than half use automated interlibrary loan; and only about one third have in-house systems of one sort or another supporting acquisitions, circulation, and serials control, or an online catalog. Only 91% of the respondents have copying machines. Interestingly, only about two-thirds of the respondents have microform (see figures 4 and 5).

About half the collections do not use CD-ROM (see figure 6).

One quarter of those that do, only subscribe to one or two products (see figure 7).

The survey respondents from the libraries ranging in size from 50,000 to 500,000 volumes, regardless of type of library, have the most technology. Apparently, the organizational flexibility exists both monetarily and within the staff to bring in new technological applications.

More than half of the respondents report expending less than 10% of their budget on technological *products*, although some of them probably included some *service* expenditures, such as charges from the utilities, in this category.

Some respondents may have included *equipment* purchases in this category also. Nevertheless, technology expenditures in more than 75% of the responding libraries do not exceed 20% of the budget (see figure 8).

The second portion of the survey requires an opinion or perception from the responder. Overall, patrons

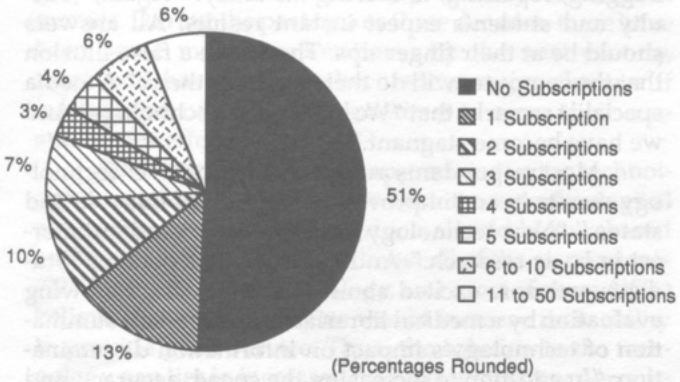

Figure 7
CD-ROM Subscriptions ($N = 238$)

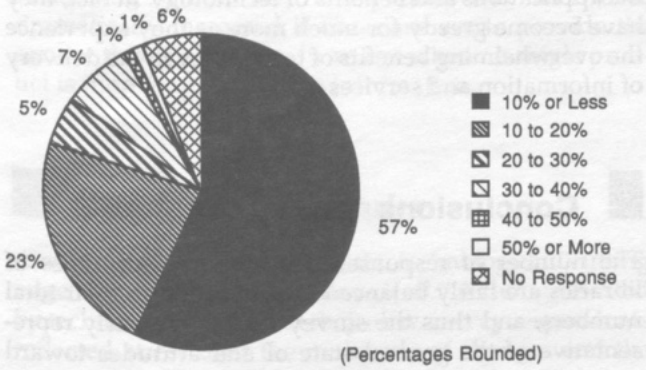

Figure 8
Percentage of Budget Allocated to Technology Purchases ($N = 238$)

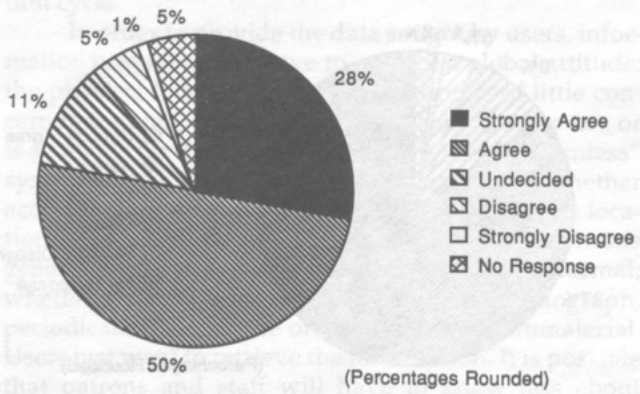

Figure 9
Patrons Appreciate Technology ($N = 238$)

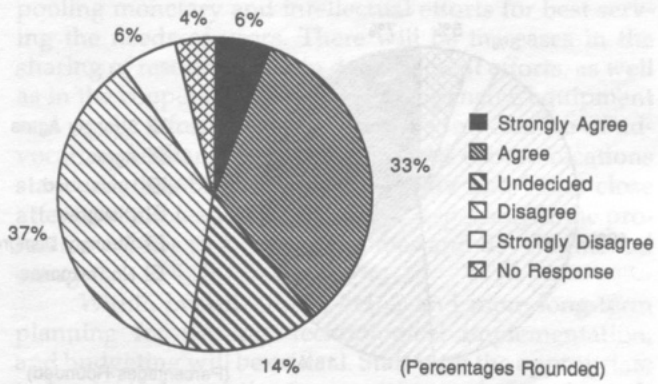

Figure 10
Technology Fully Utilized by Patrons ($N = 238$)

are perceived as extremely appreciative of technology (see figure 9).

They find technologies fairly easy to use, although they do not have access to all technologies in the library when available. Respondents perceived technologies as not utilized to their full potential by patrons (see figure 10).

That more technology would increase services to patrons is the hands-down opinion of 85% of the survey respondents (see figure 11).

Fully 96% of the respondents agree that a variety of technologies would best serve the needs of the patrons, and the response to question 22 shows that technology is perceived as critical in providing the highest quality of service to users. If patrons are perceived as appreciative of technology, library staff are seen to be even more appreciative, and staff are perceived as utilizing technology much more fully. Almost half of the respondents feel that training is inadequate.

Online catalogs are held to be a benefit to users, and respondents feel that the card catalog should be replaced by an online system. However, one question reveals a split opinion about the benefits of an online catalog versus automated circulation. The response to this question may show the pattern of the last ten years, when the library's repetitive behind-the-scenes operations were first automated.

The responses to the questions about fees are revealing. Although 70% of the respondents feel that the budget is inadequate for adding new technologies, there

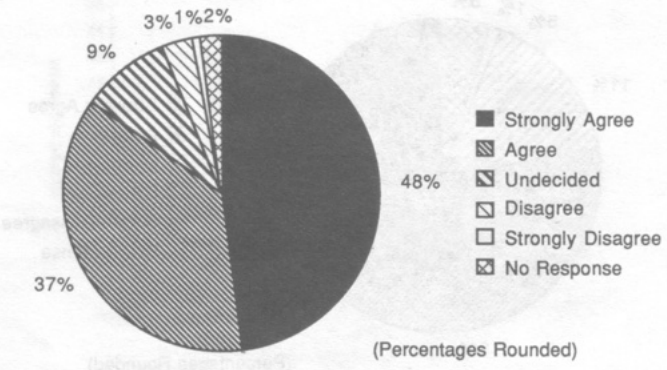

Figure 11
More Technology Would Increase Service ($N = 238$)

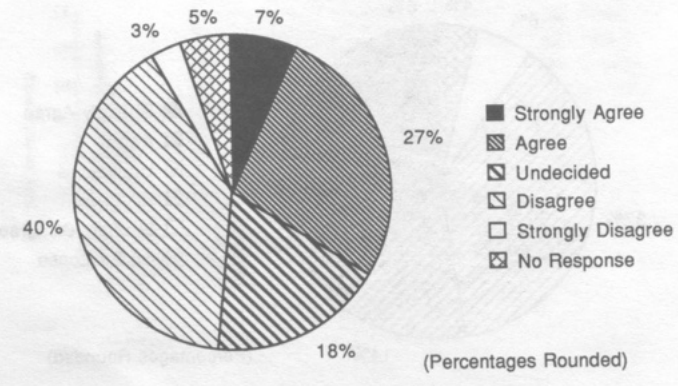

Figure 12
Staff Training is Inadequate ($N = 238$)

is nearly as strong an agreement not to charge fees for online searches. The resulting conclusion therefore is that the respondents wish to make information, in whatever format, available to all people regardless of their ability to pay.

Six open-ended questions allowed respondents to comment on technology in some detail. Many of the remarks confirm the obvious: Libraries lack money and fail to train (see figure 12); staff members do not have enough time; equipment breaks down; technological innovations put more pressure on interlibrary loan; and, naturally, patrons want more and improved technology. But there are also revelatory comments, some of which are negative: "Although we have very positive attitudes toward technology, introducing new systems is stressful. . . ." Or from another respondent, "Installing, debugging, repairing, is driving *me* crazy!" Again, "Faculty and students expect instant results. All answers should be at their finger tips. They have a false illusion that the computer will do their work for them." A media specialist remarks that "We have none [technology], and we have become stagnant."

Most respondents are extremely positive: Technology results in an "improved perception of our role and status." "New technology has stimulated student interest in basic research." And from another person, "Students are more excited about learning." The following evaluation by a medical librarian is an excellent summation of technology's impact on information dissemination: "In addition to increasing the speed, accuracy, and efficiency of providing information to our patrons, it has upgraded our image among our patrons." A media specialist concludes that "It [technology] has provided me with tremendous personal and professional growth."

Thus, it is clear that overall, the individuals responding to the survey have a positive attitude toward the applications and benefits of technology. In fact, they have become greedy for much more as they experience the overwhelming benefits of technology in the delivery of information and services.

Conclusions

The number of responses from the various types of libraries are fairly balanced in proportion to their total numbers, and thus the survey results are fairly representative of the general state of and attitudes toward technological implementation. Perhaps the most interesting indication here is that so few information workers believe that their facilities contain state-of-the-art equipment. What this means is that more money will have to be allocated in all types of facilities if administrators hope to maintain technological currency. As new technologies are made available, these too will have to be added to the agenda. That only about a third of the 238 respondents have online catalogs or use electronic mail systems and only a few more than half have access to CD-ROMs is indicative of the problem. As for the more esoteric applications, only 2% make use of expert systems, 4% have hypertext, and 8% have voice mail capabilities. There is obviously a growing gap between those libraries that have some basic technologies and those than can afford to implement virtually anything required to provide optimum service. Budgetary constraints and programmatic priorities both have a role in this inequality. Almost 60% of the respondents spend 10% or less of their budgets on technology. Less than 2%

spend 40% or more. Traditionally, personnel, monographs, and serials have eaten up virtually all allocated monies. During the past two or three decades, there have been some minor reallocations. By the next century, there will have to have been some major changes if information centers are to continue to serve their constituencies effectively.

Since patrons and staff appreciate having technology available, it seems clear that more technological equipment, devices, and products should be purchased and their services offered. Almost all of the respondents (92%) require more technology, and most of them (85%) believe that such additions would increase their ability to provide good service. Thus, the solution to the technology gap lies in increased budgets with larger percentages allocated to technology. That some patrons do not fully utilize what *is* available probably results from inadequate education and training. Such attitudes among the general population will undoubtedly change as younger people, educated in a computer-rich environment, begin to replace older generations. Training and sensitizing of both staff and patrons will have to be dramatically increased if librarians are to provide the service that is necessary in an age when no single product is more important than information.

Concluding Remarks

A number of libraries are on the technological "cutting edge" but only a very few "have it all." Although excited by technologies and what they offer, survey respondents reflected stress over the multitude of changes and the expenses incurred. The respondents are not "information technology gurus" but the people in the trenches who grapple with the day-to-day realities of too many demands, not enough staff, and not enough in the budget to do what needs to be done to position libraries and information services for the 21st century. Despite this, many survey respondents expressed excitement concerning technological benefits.

As monies tighten during the 1990s, more and more organizations will have to make tougher decisions. In many facilities, technology will be viewed as a means of delivering quality services and information at a reasonable cost, while in others it will be viewed negatively given the cost-benefit ratio. Lack of money will have a detrimental impact on the ability of many organizations to upgrade or replace in-house support systems, and it will preclude the purchase of new information storage technologies and attendant equipment, ultimately leading to a gradual deterioration in services. Technologies must be viewed as capital investments with monies raised, allocated, and expended within a short depreciation cycle.

In order to provide the data sought by users, information providers will have to assume a global attitude: the physical location of the information is of little concern to the user, as long as it appears in paper, by fax, or is available through a gopher or an ftp site. A "seamless" system will integrate all types of information, whether accessible on site or deliverable from some distant location; it also will be much more user-friendly. Patrons generally do not concern themselves with format; whether the data is located in a document, monograph, periodical article, or file on a mainframe is immaterial. Users just want to retrieve the information. It is possible that patrons and staff will have to know less about computing systems, since interfaces are bound to become more user-friendly.

As technological costs continue to spiral and information costs increase concomitantly (a limited search of the citation indexes can quickly run up $500 in charges), interest in the profession will focus even more closely on pooling monetary and intellectual efforts for best serving the needs of users. There will be increases in the sharing of resources and in development efforts, as well as in the cooperative purchase of expensive equipment and costly information sources. The importance of advocating for hardware, software, and communications standards has been stated repeatedly and bears close attention and leadership initiative, especially if the profession wishes to maximize monies and developmental energies.

Within organizations, better and more long-term planning for staffing, technological implementation, and budgeting will be critical. Staff with the appropriate technological expertise for servicing and accessing collections in order to serve users must be trained or hired. The best qualified people must be sought, especially those who have a vision for new and innovative services using existing resources and technologies supplemented by new technologies and equipment. Although a number of the survey respondents alluded to savings in staff time because of more efficient materials processing, they also commented on the increase in assistance time required to educate and aid patrons in their use of new technologies and the additional increase in staff time for maintaining equipment for public use. In other words, organizations will not be able to significantly downsize their labor forces. Longer-term planning also is required to meet the capital investments demanded by automation. Yet other portions of the budget must be protected so that books will still be available! An important component of planning is listening to what users have to say. This can be accomplished by inviting library patrons to serve on long range planning committees;

establishing an e-mail box for criticisms, suggestions, and comments; and talking with people informally about what they would like to see in the way of services. Formal surveys are always a possibility, but they are usually costly and time consuming. Library staff may find out more about users and non-users if they informally telephone 10–15 persons a month.

Librarians are in the business of accessing or acquiring information and making information resources available to users. In doing so, they are tacitly evaluating the quality of the material provided. Eventually, this role will become more apparent and useful to patrons. Several of the survey respondents, although excited by the information that users have at their fingertips, also expressed reservations because patrons think that computers provide everything of relevance on the topic. These comments point to an increasingly important role for librarians who must teach users to evaluate the information resources and stimulate patrons to continue to seek in other places.

The profession will have to become much more attuned to document delivery services, or libraries will atrophy and patrons will turn to commercial brokers. Answering reference questions via e-mail is a wonderful service; but users often want much more than to know if the library owns a copy of a certain law. They want it copied, faxed, or scanned and sent to them.

Technological issues also provide another area in which the profession must exert strong leadership. We must become advocates for the personal privacy of our patrons, their information uses, and the protection of all confidential data. The profession could play a strong educational role as the federal government contemplates a single combined database on its citizens, one that integrates tax, military service, and social security records. We must also serve as advocates for records management. As more and more information is stored in transitory formats such as computer tape and diskette, we stand to lose all social and historical records for future generations. We must strongly support the preservation of older and outmoded technologies that contain many contemporary records. Technology makes it possible for librarians and information specialists to provide a vital community, regional, state, and national service by acting as advocates for the protection of confidentiality, privacy, and national resources. It is only through the provision of such services that the traditional librarian will be able to compete with other information specialists in the technocracy that is already upon us.

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Barcoding as a Tool for Collection Use Analysis: A Pilot Project

Elizabeth McKenney Titus,
Wallace C. Grant,
and Lorraine J. Haricombe

This article discusses the value of having information on how in-house use only collections are used when making collection development and maintenance decisions. It describes a pilot project in which the feasibility of using barcoding as a method for measuring journal-use patterns is tested. Technological, economic, organizational, and political considerations associated with the implementation process are discussed. Samples of screen designs and database reports are included.

Introduction

A review of the literature shows that academic libraries pursued barcoding primarily for circulation and inventory purposes. This article discusses the use of barcoding as a method for measuring the frequency-of-use patterns of bound journal collections in an academic library setting. In December 1992, Northern Illinois University (NIU) Libraries decided to fund a pilot project to test the feasibility of using barcoding technologies to measure the use of the libraries' uncataloged bound periodicals collections. If the pilot project was successful, the library would then barcode all volumes of the bound periodical collections that were used in the library and track their frequency-of-use patterns on an ongoing basis. The project involved the following activities:

- Barcoding 1,000 uncataloged bound periodical volumes using commercially produced barcode labels.
- Building a database that contained a dummy barcode field and information on each volume that had been used.
- For barcoded volumes, scanning them after each use to document their use patterns.
- Generating management reports on the use of the bound periodicals collections.

The planning, analysis, design, implementation, and maintenance of this project was done using a team approach with participants from the administration, periodical services, and systems. A team approach is frequently taken within library organizations when working on the development of automation projects, with each of the team members contributing their expertise to the project's success.

The Administrative Role

The administrator conceptualized the idea for the project, organized the team, obtained approval to go ahead with the pilot project, got funding approved, and provided the leadership for the project. In many ways the administrator was the catalyst that took a concept and "made it happen." It was not enough to know something was technically possible; it had to be made to work in the context of the organizational environment.

The Periodical Services Role

The periodical services unit staff was responsible for the initial barcoding of the bound journal collections and scanning each volume prior to its being reshelved. The department head was the team's in-house barcoding expert and trained the staff on keeping the bound periodical use database current.

The Systems Role

The systems librarian and the systems database analyst were responsible for all aspects of hardware and software support for the project, e.g., installation, testing, and maintenance.

Project Rationale

If the project proved successful, information on the use of the uncataloged bound periodical collections could be systematically obtained and could assist in making key collection development and collection maintenance decisions.

Collection Development

NIU Libraries, like many other academic libraries nationwide, had been experiencing over the past decade severe reductions in its library materials budgets due to the combination of several economic factors. These included double-digit inflation in price increases for journals, the sustained weakness of the U.S. dollar against foreign currencies, and continuous reductions in budget allocations at the institutional level. These budget cuts had been sustained over the past several years. With

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each successive budgetary cutback, the decisions as to which journal subscriptions to be cut became increasingly difficult.

While many factors are taken into consideration when deciding which journals to cancel (e.g., cost, research or instructional level, whether the periodical is indexed, whether it is scholarly or popular, etc.), as budgets become more restrictive another factor, the frequency of use, becomes more significant in the decision-making process. To date, only a few libraries have undertaken rigorous collection-use analysis studies of their periodical collections. Many of these studies, especially those dealing with large collections such as Northern's, have only studied use patterns during a "typical week," and the data-collection process has been done manually. However, it can be argued that there is no such thing as a "typical week" when looking at use patterns in an academic library (Van House, Weil, and McClure 1990).

Consequently, our objective for this project was to develop a more accurate way to measure actual use patterns and not just look at a "typical week." In addition, the data-collection process would utilize computer technologies.

On a very limited basis, NIU Libraries began to measure the use of its bound periodicals collections in 1988. When the library created a closed-stacks access area that housed low-use bound journals (est. 100,000 volumes), data from user request forms were systematically entered into a database file that permitted the library to measure use patterns. On an annual basis, the data have been compiled and distributed to those involved in periodical collection-development activities. These data provide information on frequency-use patterns of bound periodicals located in our closed-stacks facilities.

In contrast, for our open-stack bound periodicals collection, data on their use patterns are not available. Given that the serials collections represent expenditures of over 2.2 million dollars per year, and for FY94 represented over 72% of our entire library materials budget, it was felt for collection-development decisions that data on the use of bound journals would contribute to making more informed decisions. It was also felt that this would be a much more systematic approach to measuring bound periodical use than many libraries employ: going to the shelf and physically inspecting the volume. This is sometimes referred to as the "dust test." If you can pick up the volume and blow dust off it, it is probably not highly used.

It should be noted that this project, if successful, could also offer new and innovative ways of measuring use patterns of not only in-house use only periodical collections, but also other in-house use only collection-use patterns. For example, in NIU Libraries, all the reference collections are in-house use only and the dollars expended to maintain these collections are high. Again, information on the use patterns of these collections would contribute to making better informed decisions on retention or discontinuance when reference book budgets have to be cut.

Collection Maintenance

In 1981, the NIU Libraries acquired its one millionth volume. In doing so, the building which was constructed in 1976 had reached its shelving design capacity. In 1994, the collections are over 1.4 million volumes. In order to house the existing collections, it has been necessary to increase shelving capacity in the existing building by reducing seating, converting from hard copy to microformats, and using high density closed-stack storage. Even with all these collection management options being used, within the next two years the NIU Libraries will be out of space to house the bound periodical collections. It is most likely that a substantial number of bound periodical volumes will have to be placed in either high density compact shelving areas, yet to be constructed within the existing building, or at an undetermined remote storage site.

As a basic rule of thumb in collection management, it is desirable to place in storage those items that have low use. This just makes practical sense. The document delivery cost of retrieving items from remote storage areas increases for high-use items since they have to be retrieved more frequently (Paquette 1991). These costs can be reduced if the library does not place high-demand items in storage. Also, items in remote storage areas have more limited user access. If user access to part of the collection has to be limited, then a way to minimize the adverse effects of loss of user access is to store low-use rather than high-use items.

The above would suggest that knowing what is used or not used in our bound periodical collections is a key to making better decisions on what volumes should go into storage. Making the wrong choices can be costly not only in terms of document retrieval services, but in terms of how many of our users experience loss of collection access.

Relationship to Organization

NIU Libraries is highly computerized and uses a wide range of computer systems, e.g., online systems, CD-ROM systems (single-file servers and multi-file servers), local area networks, mainframes, individual work stations, etc., for library management operations. This spe-

cific project was related to automation planning activities associated with the circulation system component of our statewide automated online catalog, ILLINET Online (IO).

Until 1992, the IO system did not have the technical capability to support barcoding. Now that IO can support barcoding, many IO participating libraries are beginning to barcode their circulating collections, e.g., University of Illinois-Urbana/Champaign and Illinois State University (Haricombe 1994). Barcoding increases the speed and improves the accuracy of check-out procedures. At NIU libraries, we currently have to keyboard in all call numbers and patron identification numbers manually when we check out items. Consequently, our check-out procedures are slow and subject to operator input errors. The barcoding of the collections would significantly reduce these problems, if not eliminate them.

If the pilot project was successful, it would set the stage for the library to make a much stronger case for the budgetary support required for barcoding the main circulating collections that were represented on IO and improve the efficiency and accuracy of our circulation check-out services. Administratively, we argued that the value of barcoding the collections was far greater than just decreasing the amount of time required to charge out materials or to increase the accuracy of check-out procedures. Barcoding also permits libraries to gain valuable information on how their collections, circulating and in-house use only, are used.

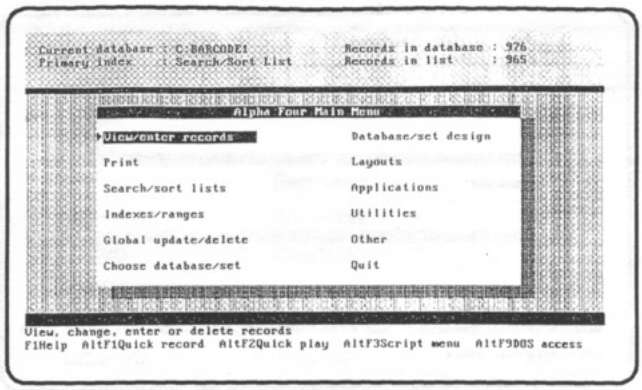

Figure 1
Screen One: Alpha Four Main Menu

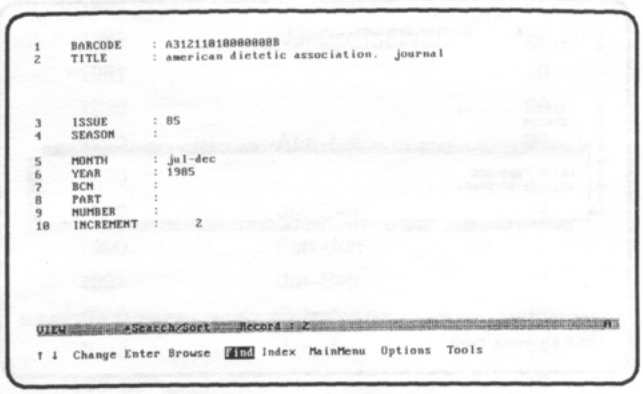

Figure 2
Screen Two: View Records Menu

Discussion of Hardware and Software

Overview

On April 10, 1993, all software and hardware associated with the project had been purchased, installed, and tested, and was operational. The bound periodical use database was built (1,000 bound journal records with barcodes loaded). Over the next several weeks, we scanned all barcoded bound volumes each time they were picked up to be reshelved. When the barcode was scanned, the record for that volume was retrieved and the count for that record automatically incremented. The computer screens shown below are the sequences used by Alpha Four. Screen one is the main menu of Alpha Four where the operator selects the "view/enter records" choice. Screen two is the view records menu where the operator selects the "find" choice. Screen three is the find screen where the operator wands the barcode. Screen four is the find screen with the barcode automatically entered by the wanding process. Screen five is the change screen reached by pressing the Enter key at the previous find screen. At this point the increment number is increased by one when the Enter key is pressed, giving screen six.

On a periodic basis, we generated management reports based on this data. At that time we were primarily interested in frequency use counts. Table 1 is a sample of a typical report.

Four major factors, cost, user friendliness, compatability, and systems staff recommendation, influenced what hardware and software were selected.

Cost

For the pilot project, the objective was to keep costs to a minimum, given the severe fiscal constraints on library

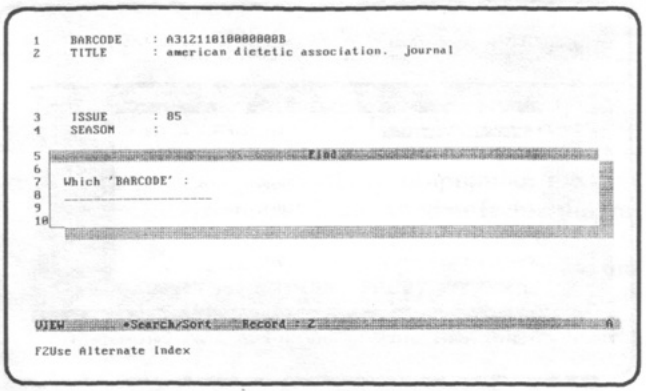

Figure 3
Screen Three: Find Screen

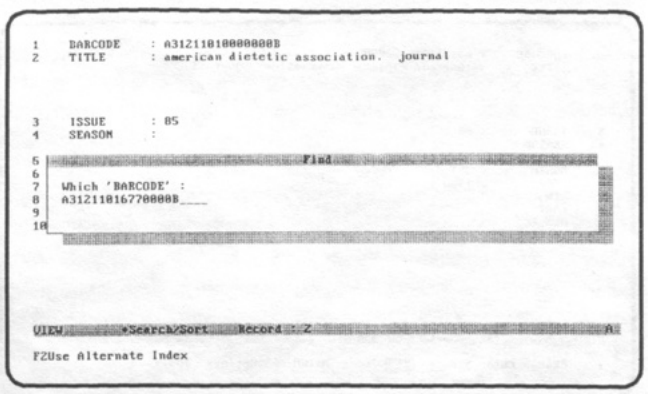

Figure 4
Screen Four:Find Screen with Barcode

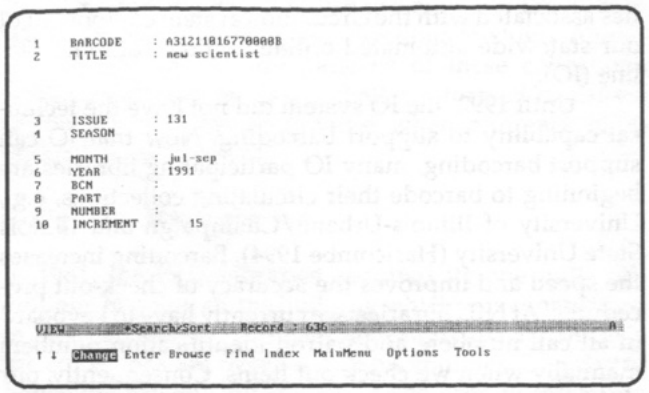

Figure 5
Screen Five: Change Screen Before Increment

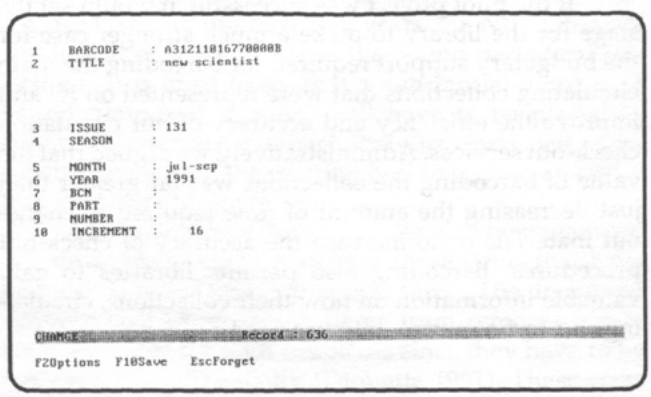

Figure 6
Screen Six: Change Screen After Increment

budgets for FY93. Existing equipment was used when at all possible, light pens were used rather than more expensive barcoding laser scanners, and comparative shopping for barcode labels from vendors was done.

Systems Data Processing Analyst Recommendations

Since the data processing analyst would be responsible for the software and hardware technical support and maintenance, his recommendations were given significant weight in the decisions on what equipment and software were selected.

User Friendliness

As a rule of thumb, the team embraced the "KISS" (Keep It Simple, Stupid) approach to project design. We wanted to keep everything as simple and easy to use as possible. This approach allowed us to keep tasks from being labor intensive, minimized training time, and permitted us to use student labor to do routine procedures associated with the project.

Compatibility

One of the initial decisions the team made was to make sure that whatever we did in terms of hardware and software associated with barcoding was compatible with the IO system requirements for barcoding. Ultimately our goal was to use barcoding within this context, and the pilot project would give us an opportunity to see what worked. For example, the choice of barcode labels was limited to Codabar because it was the only type that IO supported.

For this project, barcodes were assigned to 1,000

Table 1
Management Report of Use Patterns of Bound Journals

Title	Issue	Year	Month	Freq. Counts
Journal of Consulting and Clinical Psychology	59	1991		43
Journal of Consulting and Clinical Psychology	60	1992		39
Educational Leadership	49	1991–92	Sep–May	36
Exceptional Children	58	1991–92	Sep–May	35
Child Development	61	1990	Aug–Dec	33
Developmental Psychology	26	1990		30
Journal of Learning Disabilities	22	1989		26
Exceptional Children	56	1989–90	Sep–Apr	26
Adolescence	27	1992		25
Youth and Society	23	1991–92	Sep–Jun	23
Reading Teacher	45	1992	Feb–May	23
Journal of Youth and Adolescence	20	1991		22
Child Development	62	1991	Feb–Jun	22
Golf Digest	39	1988	Jul-Dec	22
Science News	139–40	1991		20
Journal of Social Psychology	130	1990		20
New Scientist	134	1992	Apr–Jun	20
Child Abuse and Neglect	14	1990		19
R.N.	53	1990	Jul–Dec	19
Child Development	61	1990	Feb–Jun	19
New Scientist	131	1991	Jul–Sep	19
Psychological Reports	66	1990	Feb–Jun	19
Training and Development	46	1992	Jan–Jun	19
Journal of Sport Management	3–4	1989–90		18
Journal of Multicultural Counseling	19–20	1991–92		18
Physician and Sports Medicine	18	1990	Jan–Jun	18
Child Abuse and Neglect	15	1991		17
Christianity and Crisis	50	1990–91	Feb–Jan	17
Journal of Consulting and Clinical Psychology	53	1985		17
Journal of Management Development	11	1992		17
Exceptional Children	52	1985–86	Sep–Apr	17
Golf Magazine	30	1988	Jul–Dec	17
New Scientist	133	1992	Jan–Mar	17
Journal of Business Ethics	11	1992	Jul–Dec	17
World Press Review	39	1992		16
English Journal	81	1992	Jan–Apr	16
New Scientist	129	1991	Jan–Mar	16
Journal of Advertising	18–19	1989–90		16
British Medical Journal	304	1992	Jan–Jun	16
Vital Speeches of the Day	57	1990–91		16
Physician and Sports Medicine	18	1990	Jul–Dec	16
Child Development	60	1989	Feb–Jun	16

randomly selected bound periodical volumes. Each time a barcoded volume was picked up to be reshelved, its unique barcode was scanned. When the barcode was scanned, it was linked to its unique record in a database. In order to do this, database management software was needed.

> The process of identifying items in a library's collection by assigning to each a unique machine readable code has been generally referred to as barcoding. Barcoding is much more than simply affixing a coded label to each item in the collection. The process must include, by some method, the linking of each code to an appropriate item record in the library's bibliographic database. (Kennedy and Lach 1986, 1)

The NIU Libraries is a heavy user of database management software, e.g., Alpha Four, Reflex, Dbase, and Paradox. Our decision was to use Alpha Four database software for several reasons. It was user friendly, had pull down menus, online help, was Dbase compatible, and we already were using this product extensively within the library. Our database analyst considered Alpha Four to be one of the best products on the market because it was easy for general users and because it had an excellent sort function (Titus 1993). Numerous software reviews of Alpha Four overwhelmingly supported the team's reasons for choosing this particular software product (Canter et al. 1993; Plain 1993; Salemi, Pastrick, and Walton 1991). Also, Alpha Four is a relational database. "Users may access information in multiple databases simultaneously. Each database in the set may have multiple relationships and can automatically handle one-to-many links" ("Alpha Four" 1992). A relational database would allow us to do further analysis of the file we were creating in relation to other files at a later date. For example, we would have the capability of linking FAXON database files which contain periodical cost information, e.g., prices, inflation rates, etc., with our files on use patterns.

The barcoding configuration software permits the computer system to know what it should expect to see when the barcode is scanned. For example, since there are many types of barcodes, e.g., Code 39, UPC Version A, EAN-13, Codabar, UPC Version E, etc., the computer needs to know which barcode it is reading. EZ Barcode was selected based on information found in a database called Computer Select. This database, produced by Ziff Communications Company, gives reviews and specifications for computer hardware and software products currently available from suppliers. EZ Barcode was highly rated, easy to use, and was in our cost range.

Impact and Lessons Learned

Even though we only ran the pilot project for a short time, we gained valuable insights into a variety of activities associated with barcoding as a means of measuring collections use. At this stage, we have sufficient confidence in the technological and operational feasibility of this approach to propose funding for expanding the scope of collections barcoded to include all bound journals being used (est. 250,000 volumes). Some of the impacts and lessons learned from the pilot project to date are briefly discussed below.

Technological

Software

The software we selected for the pilot project performed well and did everything we wanted it to do. Alpha Four was very user friendly, and we operated this project using student employees. Training time was minimal. EZ Barcode also was easy to configure to read Codabar.

One of the strengths of doing pilot projects is that it permits you to get part of a system up and running quickly. However, one of its drawbacks is that you do not have the full system operational. The software we selected worked fine for the pilot. What remains unanswered at this time is how it will perform given high-volume activity levels and sustained use. Since we have worked with Alpha Four using large database files, we are very confident it will perform well as the scope of the project expands.

We also know that if we are going to use Intermec laser scanners, they will not run on the hardware we are using for the pilot project. We have done some testing of Intermec laser scanners and they work on one of our newer workstations, but not on the Zenith that was used for the pilot project. We did not know why there was this problem, and the Intermec technical staff worked with our staff to determine why it did not work. We were fortunate that the vendor was able to provide technical support. This is not always the case. The basic lesson we have learned in the past about software and hardware is to test it to see that it works, or have the vendor prove it works. Too many vendors say their products are compatible or will perform certain functions, but when libraries purchase the item, they find out they do not operate as promised.

Database

The database design seemed to work well. Originally, the team thought that building the database would be slower than it actually was. However, this was still the

most labor-intensive aspect of the whole project, especially during the initial phases of the project. By doing the pilot project, we now have better information for estimating how long building the entire database is likely to take.

We are beginning to look at how increasing the size of the database impacts on database maintenance operations. Our thinking is to split the database files between two or more workstations. That way, we can have more than one staff member creating new records in the database or doing scanning simultaneously, and not cause unacceptable backlogs of items waiting to be processed for reshelving.

As expected, minor problems associated with the database tended not to be technological in nature, but were caused by operator errors. There were blank records and duplicate records in the database that had to be corrected before we could get management reports. From past experience working with databases, we know that no matter how much training is done, these types of errors happen. Consequently, we just plan to scan the database looking for these types of problems and correct them when we see them.

Barcodes

We learned that barcoding technology is not as simple as it appears! The decisions you make about types of barcodes and labels used do make a difference, affecting costs, reliability, etc. First, we found out that some types of barcodes scan better than others. For example, barcodes with spaces between sections of the bars do not scan as well as barcodes with no spaces. The printed size of the barcode also seems to make a difference. Our preference was for compact barcodes since they seemed to scan better.

Second, you need to consider what type of barcode labels you use. Since we were using light pens, we were especially concerned about the wear and tear on the barcode label surface. Not all barcode labels have a protective layer and those without are subject to deterioration when the light pen is run across the barcode. Before ordering labels, we tested label samples from vendors and made sure we only ordered labels with a protective coating. The team also felt that if the library was going to expand the pilot project, we would use scanners rather than light pens to read the barcodes. With scanners, one does not have to touch the surface of the barcode label at all.

Third, none of the label adhesives were very good at adhering. They could all easily be peeled off. We have no solution to this problem other than to purchase labels with as strong an adhesive as possible.

Fourth, one can cut the cost of barcode labels almost in half by shopping around for the best price. We found prices that ranged from $48/1,000 labels down to $14/1,000 labels. The cost savings are substantial when one is barcoding large collections.

Economic

If NIU Libraries decides to do barcoding, then there will be both short- and long-term fiscal impacts. Start up costs for the hardware, software, and barcode labels associated with this project are estimated at $7,500. One needs to add in the labor costs as well. After the first year, the costs of maintenance (e.g., barcode labels, labor, etc.) should be considered on an ongoing basis. This specific barcoding project was modest in terms of collection size. The costs would be substantially higher for barcoding our main book collections (1.3 million volumes). While the pilot project was successful technologically, we still need to identify funds to support barcoding activities. Having something technologically feasible is not enough. It also has to be able to be done within the organization, be politically possible, and economically feasible.

Organizational

Any new procedure being introduced into an organization's operations changes the way in which business is done. In terms of the project design, the objective was to keep the impact of changes in daily operational shelving procedures minimal. However, we knew from the outset that if we decided to do barcoding, it would indeed add steps to the collections maintenance procedures in the library.

Since Periodical Services was the primary unit where the barcoding would be done, the unit would have to change its operational procedures. The team decided from the start that the Periodical Services staff would be actively involved in all phases of the project's planning and design. Before reshelving the barcoded items that were picked up, the items were scanned into the database to increment their use by one. This procedure did not cause any significant delay in the reshelving of the items. (Items from the last pick up at night were scanned in the morning before they were reshelved.) It was felt that if the project were ultimately to be successful, it would have to be understood and supported at the basic operational level. The Periodical Services staff needed to know "how to barcode," and to understand why this was a task worth doing and its importance to the organization.

Political

The importance of having other stakeholders, i.e., those making collection development decisions, participate in the planning and design of the project was also discussed by the team. The importance of this group in participating at the early stages of planning was twofold. First, to reinforce a common group value, i.e., information on use patterns of collections can assist in making more informed collection-development decisions. Second, to have this group validate the process or the way the information is collected. No administrator, especially one in the public sector, wants to invest in data gathering that is not viewed as useful or meaningful by his or her own staff, let alone those who are politically influential externally, e.g., university administrators, faculty outside the library, etc.

Discussions with those involved with making decisions for collection development within NIU Libraries centered around several themes. In general, librarians tend to value knowing not only how collections are used but also who is using them. However, they seem to have a variety of opinions on what approaches should be taken in measuring collection use and which collections are worth measuring. For example, many argue that you can never really accurately measure total collection use, because an individual may reshelve an item and none of our measures, e.g., circulation counts, in-house use studies, etc., measure this type of use. Practically speaking, you always will have the problem of undercounts. All you can do is acknowledge that there are cases where individuals use the library collections and reshelve the materials themselves. You can also encourage those using the collections, as much as possible, not to reshelve items.

Others in the group were very excited about using barcoding applications with other non-circulating collections. One department head has volunteered to barcode the reference collection for which he has collection-development responsibilities to see whether use patterns can be measured.

Another department head would like to barcode printed indexes that are also available as part of our local area networks. The question this department head would like to investigate is, Has there been a shift away from the use of the manual indexes to computerized products sufficient to warrant cancellation of the print copies of the indexes?

While the opinions of the collection development librarians were diverse, what we saw was productive and constructive discussion within the group on the usefulness of barcoding as a means of measuring use patterns. For those who did not believe information on use patterns contributed to collection-development decision making, the impact was even more pronounced, i.e., creative thinking of applications beyond the pilot project.

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Appendix

Software used for pilot project

Alpha Four Version 2.1, Alpha Software Corporation, One North Ave., Burlington, MA 01903

Configuration software for EZ Barcode:

Reader Model PC, Timekeeping Systems, Inc., 1306 East 55th St., Cleveland, OH 44103

Hardware used for pilot

Zenith 148, keyboard, CGA monitor, 20MB hard disk drive, EZ barcode system (Wedge), Intermec 1545 scanner, 14-digit barcode labels (Codabar)

Recommended for full project

386SX 33 Mhz, keyboard, VGA 640 x 480 color monitor, 100MB hard disk drive, Intermec 1545 scanners, 14-digit barcode labels (Codabar)

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The Expert Cataloging Assistant Project at the National Library of Medicine

Paul J. Weiss

Over the last few years, the National Library of Medicine (NLM) has pursued the development of an expert system to assist catalogers with personal name authority work. This article reviews the project, from project and tool selection through knowledge engineering to evaluation, and discusses the reasons for deciding to redirect NLM's energies from development of an operational system to modification of the cataloging rules.

During 1985 and 1986 staff from the National Library of Medicine, the Library of Congress, and the National Agricultural Library met to discuss possibilities and plans for expert systems development in the area of technical services. NLM's Library Operations (LO) staff was interested in taking advantage of this promising new technology to enhance cataloging productivity and/or efficiency. Cataloging was selected since it is such an expensive activity and therefore a potential area for cost savings, and it requires both knowledge of a complex set of rules and their professional-level interpretation.

After much planning and discussion with staff in the NLM's research and development branch, the Lister Hill National Center for Biomedical Communications (LHC), a position for Systems Librarian in the Office of the Chief of the Technical Services Division (TSD) was established primarily, but not exclusively, to be the system developer for this project. As a librarian who had been a cataloger for three and a half years and who had taken courses on expert systems in library school, I was selected for this position in July 1989. Other NLM staff also have been involved in the project, including the chief and deputy chief of the division, for planning and oversight; two cataloging liaisons for their perspectives; and a computer scientist in Lister Hill for technical consultation.

Planning the Project

The initial project objective was to use artificial intelligence and expert systems technology to reduce the level of human effort required in the costly cataloging process. Although TSD expected eventually to cover the whole range of cataloging, a manageable portion was needed for the initial stage of the project. Authority work was chosen because it is one of the most time-consuming, and therefore costliest, aspects of cataloging. (An in-house study conducted in 1986 showed that for monographs cataloging, NLM spent 45% of its cataloging time on authority work, compared with 36% on descriptive cataloging and 19% on subject cataloging and classification.) Authority work also requires significant training time for new catalogers. Expert systems technology is usually applied to activities where either a small amount of time can be saved on a short, but often repeated process or a large amount of time can be saved on a longer process. The project team chose to work on an activity of the first type, selecting personal names, which are the most frequently occurring name headings in NLM's catalog records.

The system was to be designed to assist the human cataloger in selecting the form of a personal name heading to be used in catalog records. The program would take the form of the name found in the bibliographic description, search NLM's and LC's name authority files, examine the search results, and download an LC authority record if appropriate. If a match was not found, the program would recommend to the cataloger what the correct form of the name should be according to the *Anglo-American Cataloguing Rules*, 2nd ed. (*AACR2*) and create the local authority record.

The project team planned for the initial knowledge base of the system to contain rules from *AACR2* (especially chapter 22, "Headings for Persons"), the Library of Congress's Rule Interpretations (LCRI) for those *AACR2* rules, local NLM practice, communications protocols for accessing NLM's and LC's computers, and search syntax for the name authority files. Then knowledge engineering techniques would be used to extract from professional catalogers information on how to construct authority file search statements based on the form of the name in the description, how to interpret search results, and how to apply the rules in the aforementioned tools.

If this part of the system were successfully implemented, a natural extension would be authority work for other types of headings. Later, more intelligent analysis could be performed to differentiate persons or corporate bodies with identical names. This analysis would be based on the subject areas of the authors' works, when items were published, and other data in authority and bibliographic records. Many other long-term additions were contemplated that could move the system toward a fully automated cataloger's workstation. Such a system could include natural language processing, an interactive user interface, real-time access to online files, and the ability to incorporate into its knowledge base feedback from catalogers using the system.

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The project team knew from the beginning that for the system to be successful it had to be fast and easy to use; catalogers would not use the system otherwise. This would require some degree of integration with existing processing systems in the library. There were also plans to distribute relevant portions of the expert system to other libraries.

Soon after the project began, NLM brought in an expert systems consultant to advise the library on several projects, including TSD's. One of his most valuable recommendations was to narrow the scope of the project; TSD was trying to do too much, especially as a first venture. The project team decided to limit the project initially to *AACR2* heading formulation, postponing work on automated searching. In addition, the consultant advised the project team that often the benefits of building an expert system lie more in the necessary rethinking of policies and procedures than in the specific end product. This was made explicit by making the identification of inconsistent or incomplete rules the second objective of the project. The consultant returned after six months for additional discussions.

NLM decided to follow another of the consultant's recommendations—to start with rapid prototyping. The idea behind rapid prototyping is to develop a model of the system iteratively and quickly. First Class, a low-end expert system development package, was selected because it was already at the library and could be used immediately, there was in-house expertise in using First Class, and it had a reputation for user-friendliness. It is not a true rule-based system, but rather a decision-tree system, in which there are a set number of logical paths. It became clear that using a decision-tree system would not be satisfactory, as NLM wanted to take advantage of the power of independent rules which are used as needed. In addition, the program's optimization techniques were not suitable for use in the project, its handling of uncertainty was unacceptable, it had virtually no explanation capabilities, it had a poor editor and poor documentation, and it could neither handle default values nor pass parameters. Nevertheless, the experience of rapid prototyping did prove worthwhile, as it prompted much more analytical thinking about the *AACR2* rules and made the development of selection criteria for project software easier.

Software and Hardware Selection

Although most expert systems in libraries are now developed using expert system development packages rather than general or specialized programming languages such as PROLOG, the various shells do vary extensively, and a suitable match between software and project must be found.

Based on various recommendations for project software and hardware, it was tentatively decided to use a Sun workstation running UNIX with Nexpert Object as the expert system development tool. The Sun was favored for its power, flexibility, and speed. Nexpert's advantages included a graphical user interface, platform portability, an open architecture that allowed integration with other programs, and an object-oriented programming environment.

During the rapid-prototyping phase, the project team made final hardware and software selection decisions. At the time, the Computer Sciences Branch in Lister Hill was in the process of completing its own expert system development package, CTX (Criteria Expert). The project team considered it but felt that it was not suitable for this project as it was criteria-based (well-suited to diagnostic work) rather than rule-based. Additionally CTX was still under development and subject to frequent modifications. Given the advantages described above, the decision to purchase Nexpert was reaffirmed.

As stated above, one of Nexpert's strong points is cross-platform portability. Any code developed on one platform can be transported and used on a different platform. Since there was extensive familiarity at the Library with the IBM/DOS environment, and all the catalogers' production machines were DOS-based, that platform was selected. There would be far less training time involved than if the environment were switched to the Sun; the actual programming of the expert system could begin much sooner. The original project system consisted of an IBM PS/2 Model 55 SX at 16 MHz with 2MB of memory and a VGA display. Due to speed, memory, and display size and resolution constraints, this workstation was quickly upgraded to an IBM PS/2 Model 70 at 25 MHz with 8MB of memory and a 1024 x 768 pixel display. On these machines Nexpert runs under Microsoft Windows.

The object-oriented environment of Nexpert is significantly different from procedure- and list-oriented programming environments. There proved to be a much longer learning curve than anticipated. This was compounded by the many deficiencies of Nexpert itself, which was extremely frustrating to use. The first version used in the project was poorly documented and had many design, display, and printing problems. Design flaws included no Boolean OR, no ELSE, and unfortunate pattern matching restrictions. Editing features were minimal and terminological use was idiosyncratic. Technical support was uneven and often not courteous or quick. By the end of the project, programming time was still about 65% working on "Nexpertese" and only 35% performing intellectual tasks.

Knowledge Engineering

To help the Lister Hill technical consultant understand the authority control process, the first few pages of the relevant portion of *AACR2* were flowcharted, using a software package called EasyFlow. This explicit mapping of the intellectual flow became useful not only as an introduction for a non-librarian to personal name authority work, but also for the elucidation of some of the details and implications of the rules. The process of mapping the logical structure of the chapter therefore continued. (Shaw was useful, but not detailed enough.[1])

Ambiguous meanings of certain words and phrases were a major problem. For example, "his or her language" is used many times in the chapter. Possible meanings include: the language the item was originally written in, the language of the item in hand, the primary speaking or writing language of the author, or the author's native language. All of these are of course often the same, but there are cases where there are two or more languages involved. In some parts of the rules, it seems that one of these definitions applies, in other areas, another definition. These are similar findings to Hjerppe and Olander.[2]

It is a rule of thumb in the expert system literature that the system developer should use other individuals in determining the content of the knowledge base. As the first step in "mining" knowledge from another person, a cataloger was observed in the process of performing personal name authority work. Watching the process of determining what is included in the concept "name" (capitalization, punctuation, diacritics, etc.) was quite valuable, as it clearly demonstrated that the rules are interpreted differently by different people and showed some of the areas in the process that are subjective. This experience proved that extracting knowledge is not nearly as easy as it may seem; the methods used must be well thought out.

During the early stages of the project, other researchers doing related work were contacted. Although none were conducting work specifically on personal names, communication with them was valuable to see where other researchers were going in the area of expert systems in cataloging, particularly authority work, and to gain insight into the problems encountered and techniques used in building these systems.

As suggested by the Lister Hill consultant, the first nuts-and-bolts stage of the project was the development of a skeleton of a prototype for simple names. This would yield real experience programming with Nexpert (especially its object-oriented aspects), produce a demonstrable prototype, and provide something to append real intelligence to. The small prototype gave the correct *AACR2* form of the name as output for the trivial case of English-language forename–simple surname as well as

- names with forename initials (e.g., Alice B. Toklas),
- most multiple forenames (e.g., Paul Michael Glaser),
- hyphenated forenames and surnames (e.g., Wen-Mei Kao, Diane Vizine-Goetz),
- short surname prefixes (e.g., Stephen Van Zandt), and
- additions of dates for non-unique names.

It did not correctly handle

- short middle names (e.g., Mary Sue Masterson),
- long surname prefixes (e.g., Tony Della Copa), or
- unhyphenated compound surnames (e.g., Andrew Lloyd Webber).

The project team then met to decide which area of the system to flesh out with intelligence. The leading possibilities were the *AACR2* rules for surname prefixes and determining whether two names are for the same person by examining subject areas written about. The project team selected the first option since its knowledge base could still be built from *AACR2*, whereas the second would require a very different knowledge base.

Rule 22.5D1 (Surnames with separately written prefixes—Articles and prepositions) was examined; the rules for Dutch and German were the most complex, so the project team decided to work with them, as well as the rule for English. The prefixed personal names in approximately 1,000 NLM bibliographic records each for Dutch- and German-language items were examined to see how well NLM catalogers had followed the rules and to find any areas of difficulty for the expert system. There were very few intellectual errors found in the form of heading; given the complexity of the rules, this is a tribute to the skills of NLM's cataloging staff. After the incorporation of rules for Dutch, German, and English prefixed names and other refinements, the system produced the correct *AACR2* form for names of authors writing in English, Dutch, or German. Areas of difficulty that remained were the Library of Congress Rule Interpretations (LCRI) for Dutch authors who write in English (which says to follow the rule for Dutch rather than the rule for English), names that are not of Dutch origin, hyphenated compound surnames with prefixes (e.g., Adriana C. Gittenberger-de Groot), and abbreviated prefixes (e.g., Eberhard Neumann-Redlin v. Meding).

Review and Future of the Project

The project had now been underway for two and one-half years, costing approximately $104,000 for person-

nel, $15,000 for equipment, and $1,000 for other expenses; and a small, but complex portion of the rules, requiring intelligence, had been programmed into the system. At this juncture, the project was reviewed by LO and LHC staff in order to assess progress and determine whether the project should be continued. The project team presented four recommendations related to the project:

1. Discontinue the development of the expert system itself.
2. Investigate the utility and feasibility of implementing some or all of the logic within the expert system in NLM's technical processing systems; if deemed desirable and feasible, proceed with programming.
3. For the more easily resolved problems, continue participating in traditional approaches to rule revision.
4. Gain support and acceptance for needed fundamental changes to rules and practices and their implementation through a research and demonstration project.

The first three recommendations were accepted, and the fourth is under further investigation.

The rationale behind the first recommendation was that the time and effort that would be required to complete the project would be extensive. The underlying problem is that the rules themselves in their current state are not well suited to machine manipulation. In performing the intellectual analysis of chapter 22, several sections of the rules were identified as ambiguous or contradictory. Additional problems included undefined, ambiguous words and phrases; incorrect organization; unclear order and priorities; gaps in the rules; and rules that are not followed in practice. Most of these issues seldom affect the way humans use the rules, but computers are more rigid. The chapter is far more complex than most catalogers ever realize and requires a great deal of real-world knowledge. This exploration was the impetus behind the third and fourth recommendations.

Additionally, the percentage of names that are difficult for a cataloger, but that could reasonably be built into the system, is small. It is difficult to get the system to recognize exceptions. For example, more than a quarter of the chapter is devoted to special rules for names in certain languages. Even if it were decided that it is not worth entering the rules for these names into the system, the system still needs to identify such names in order *not* to process them. For some of the languages this would be quite difficult. Another issue is that dissatisfaction with Nexpert would lead to the selection, procurement, and learning of a new package, with the consequent knowledge base conversion.

The second recommendation has been carried out. TSD management did consider incorporating some or all of the logic encoded thus far into existing processing systems, in particular at the order stage of processing. Upon further examination, however, this did not appear worthwhile. The acquisitions staff already transcribe personal names in a standard way which is very often the AACR2 form (other than additions).

As part of the third recommendation, TSD submitted several suggestions based on knowledge gained during this project to the Library of Congress during LC's discussions with NLM and NAL on "cataloging simplification."

The fourth recommendation is the most ambitious, and also potentially the most rewarding. The division intends to develop improved, overtly principled portions of chapter 22, test these new rules, share the findings with the national cataloging community, and, if appropriate, pursue integration of the rewritten rules into *AACR2*. The current chapter contains very complex rules, it requires much real-world knowledge, and rationales are not given for the rules. The international data-sharing purpose of the rules is still not functioning at the level that was envisioned. *AACR2* is not used in many parts of the world. Even in some countries where it is generally followed, some language-specific portions are not adhered to. For example, at the Royal Library of Belgium, Part I and portions of Part II of *AACR2* are followed, but the rule on prefixed names is not followed. They simply enter all names under prefix, as is done for English![3] Domestic use certainly doesn't justify that rule.

The rewriting of the rules would emphasize simplicity, background and rationale, and selection of a single authorized form rather than a "best" authorized form.

Massaging data is often performed more effectively and efficiently upon retrieval rather than at time of storage. A better front end could be developed to match search terms to headings. Issues to be assessed during testing will include the time spent performing personal name authority work under new and old rules; the cheapest way that the authority work can be carried out; precision, recall, and other retrieval measures; and understandability of displays. The rewritten rules should be so simple to apply that there is no need for an expert system to be automated.

Conclusion

Although the division did not gain the production expert system it had originally hoped for, it has realized

other benefits. TSD now has a better appreciation of what processes are good candidates for an expert system: those that are very specific, deal with a small domain, and are relatively self-contained. Automating *AACR2* does not fit these characteristics; it contains some very general rules and its use is definitely not self-contained, but interacts with national, utility, and local rule interpretations and other policies, as well as a good deal of real-world knowledge and common sense. Most importantly, experience with the technology has led to the realization of the extent to which *AACR2* rules are not logically presented and are not always applied as written and require real-world knowledge. A closer examination of the rules themselves is leading NLM to take a proactive approach in encouraging their improvement. We are attempting to heal the wound rather than create a technically sophisticated bandage.

References

1. Malcolm Shaw and others, *Using AACR2: A Diagrammatic Approach* (Phoenix, Ariz.: Oryx, 1981).
2. Roland Hjerppe and Birgitta Olander, "Cataloging and Expert Systems: AACR2 as a Knowledge Base," *Journal of the American Society for Information Science* 40, no. 1 (1989): 27–44.
3. Paula Goossens (head of the automation group, Koninklijke Bibliotheek Albert I), personal communication, Bethesda, Md., October 1991; facsimile, 12 October 1993.

Library of the Future, 2d Edition 950 Literary Titles on One CD-ROM

World Library, Inc., 12914 Haster St., Garden Grove, CA 92640; 1-800-443-0238. System Requirements for DOS: IBM PC XT, AT, or 386 or compatible with 640K of memory, a hard disk drive, CD-ROM drive with CD-ROM drivers (MS-DOS extensions 2.0 or above), and a VGA monitor required to view illustrations. System requirements for Windows: 386 PC or faster, 2MB or more of RAM, Windows 3.1 or higher, VGA monitor, CD-ROM drive plus drivers. Mouse recommended but not required. No sound required.

The *Library of the Future* is a literary library on CD-ROM which contains 950 unabridged literary titles and puts many personal libraries to shame. It is a thorougly pleasing text-based product that may be useful in either a library or personal setting.

Installation

The software can be installed for operation from either DOS or Windows. If using the DOS installation, log on to the CD drive letter and type "install." Under Windows, open the program manager window and choose "run" from the file menu. Then enter the drive letter for the CD-ROM drive in the command line box, followed by :\install and press Enter. Another option is to do the install by opening the File Manager window, switch to the CD-ROM drive and then double-click on install.exe or winsetup.exe. The CD comes with a booklet that explains installation in detail and the software helps avoid doing anything permanent to the computer. Installation is very quick.

Normal Operation

The main menu of the program is an easy-to-use environment for starting searches. Options to choose from include searching by title, author, words, and strategy.

Both title and author searches give a listing in alphabetical order. A letter may be keyed in as well, and this will take the operator to the beginning of an alphabetical section. The word search will actually allow words to be looked up that occur together on the same screen rather than just in a single phrase. It will even extend that search to adjacent screens, although this does take a little longer.

The really interesting option is the Strategy option. It will take the listed word strategy and allow a time or place proviso to be put on it. For example, the search may be for the word "dogs" before the age of Mohammed in the countries of China and Arabia. This would give two hits (*Analects of Confucius* and *The Koran*). There are eighteen countries to choose from, four world regions, seven ages, seven eras, and thirteen categories to work with, with potential overlap on both the locations and times. It is also possible to use these search features without using an initial keyword.

Interesting phrases may lead to a hypertext search using that phrase as the key. This will take the string of characters that is selected and go through the entire database to find a comparison. If the string is too long, the program will select only a portion of it. Upon completing a search and obtaining the text, the results may be minimized and a new search started with no loss of data. Up to eight works at a time may be viewed in Windows and two at a time in DOS. One more point about the searches, they are fast. There are no long waits to see results.

Screens or whole works may be sent to the printer or downloaded to a text file. Sections may be clipped out and pasted elsewhere using standard Windows-based features.

Research is assisted by bookmarks, which may be left at particularly interesting places, allowing the researcher to return to them on command. The curious browser will find a limited description of the work and author available by clicking on "description" after a document is selected.

The Contents

The 293 megabytes on the disk contain an excellent selection of titles. Rather than the "shotgun" method of selection seen in most works of this type, this disk contains carefully chosen pieces. The people in charge of selection seemed to pick works that would give a broad base to any of the subjects that they felt would be good to explore. For example, it was surprising to encounter the *Egyptian Book of the Dead* (*Papyrus of Ani*). Upon further examination it quickly became clear that finding such an odd piece was not a unique occurrence. The religious works identified by selecting the search terms *religion, myth,* and *sacred* on this disk consist of twenty-three separate works. The longest, 3,755 screens long, is the *King James Bible,* and the shortest at 16 screens is Confucius' *The Great Learning.*

The entire work has the feel of powerful spectrums. For Plato, there are 25 titles. For economics, extremes like Karl Marx and Adam Smith are juxtaposed. For children's works many of the well known works of Hans Christian Andersen, Louisa May Alcott, and Jack London are provided. For drama there is an immediate opportunity to compare Boccaccio's *Decameron* to the plays of Shakespeare.

While it may seem unfortunate

that there is no more recent work in the pile than Drexler's *Engines of Creation* (a 1985 work on the possible ramifications of nanotechnology) and there is no more ancient work than the *Egyptian Book of the Dead* (2400 BC), this is actually not unreasonable considering the number of works covered. The bulk of the works, a little over half, are dated between 1666 and 1900.

Documentation

The disk comes with a small booklet with installation instructions and a partial list of the contents. It also has an accompanying software guidebook that resides on the CD along with the program and explains how to operate the software and what system requirements there are.

Problems

Yes, the disk does have a few noteworthy difficulties. None of them are going to be insurmountable for the average user, but should be considered.

The most apparent difficulty the user will run into is the occasional strange behavior of the front-end software. The program has a tendency to "lose" screens when minimized to icon form and subsequently maximized. The screens do not actually get lost but only disappear. This problem is easily solved, however, by clicking on the minus sign in the upper left hand corner of the window and selecting "restore" from the options given.

Equally unamusing is that the accompanying guidebook has a tendency to lock up. There appears to be no simpler solution than control + alt + delete to solve this.

An irritating point is that the "guidebook" is the first place to encounter the information on system requirements and yet this "guidebook" is on the CD-ROM. This seems to be a rather late point in either the purchase or installation process to obtain this information.

The illustrations are few in number and do not translate particularly well, especially to a high-resolution monitor. A lot of them are indiscernible without painstaking examination. Sometimes, not even the accompanying text is enough to tell what they are. They definitely do not stand alone. The best seemed to be Darwin's scientific drawings and the worst were from the *Popul Vuh*. The emphasis on this disk is access to the text files of these famous works and not graphic or multimedia presentations. This is not the disk for the person in search of fanciful illustrations.

There are also a few data-entry type errors, such as the designation of the *Code of Hammurabi* as both 1780 BC and 2500 BC.

Miscellaneous

World Library, Inc. has free technical support at their 800 number. This is only available from 8:00 a.m. to 5:00 p.m., Pacific time. As usual, the registration card must be sent in to receive technical assistance. The licensing agreement does allow the printing and clipping out of sections for personal use. There are no automatic provisions for network licensing available, but the publisher should be contacted if this is desired.

Recommendations

This disk is ideal for the bibliophile. It would be a good item for most students at high-school level or higher. Its fast searching capabilities work well with the needs of someone doing research and may be an interesting product to load on a library server as a way to provide access to an important base of classic texts at a low cost. This disk would not be a very good item for younger children as it does not have the multimedia glitz that many children have come to expect.

The *Library of the Future* is thoroughly pleasing.—*Scott McNulty, CARL Corporation, Denver*

The Chronicle Guide to Grants Evaluation

Chronicle of Higher Education, 1255 Twenty-Third St. N.W., Washington, DC 20037; orders 1-800-287-6072, technical help (202) 466-7220. Price for one-year subscription: disk version $295; CD-ROM version $395. Networking pricing is available. Disk version requirements: IBM-AT, PS/2, or IBM-PC compatible computer with at least a 286 capability, DOS 3.1 or higher, hard disk with 18MB free space to load initial database, 2MB for each update loaded, and 30MB free to load and index updates, 640K RAM with 580K RAM available to run search software. CD-ROM version requirements: IBM-PC or compatible with a CD-ROM drive.

The Chronicle Guide to Grants is a database of more than 23,000 grants awarded by more than 1,084 foundation and corporate grant makers. It is a compilation of grant awards listed in *The Chronicle of Philanthropy*. The database is available in both disk and CD-ROM formats and is updated every other month.

Installation

Both versions of the software were tested on an IBM compatible 486DX 33 Mhz with a Hitachi 3700 CD-ROM drive. Installation of the software was quick and simple. The CD-ROM software is loaded by starting Microsoft extensions, changing to the CD-ROM directory, and typing

"Install." This software was loaded in less than one minute. The disk version of the software is loaded by putting the first of five disks in the disk drive, changing to the proper drive, and typing "Install." Five 3.5-inch disks of data and search software were loaded in ten minutes. Both versions will install using either a "standard installation" or a "custom installation." Choose the "custom installation" if you do not want the software to change the config.sys or autoexec.bat files. The CD-ROM version will ask for the CD-ROM drive letter the first time it is used. The System Administrator menu choice on the opening screen will add new grant records, export grant records to a computer file, and delete records to free up space with the hard drive version. In addition, it will allow screen colors to be changed, sound to be turned on and off, and a password to be set for future access. If the system is to be used by the public, it is advisable to set the password to avoid unauthorized access to the software and data.

Operation

The program's opening screen will allow a user to conduct a Quick Search or an Enhanced Search, change databases, use System Administrator, or exit. The Guide to Grants is actually two databases. The default is the Grants database, which lists the grant maker, the grant maker's address, the recipient, a description of the grant, and added subject headings. The second database is a list of the Grant Makers and their addresses. Changing from the Grant database to the Grant Maker database is done via a menu choice in the opening screen. Online help screens and print documentation describe the functions of both databases, but more detailed information would make it easier to determine which database to choose. The software continues to display which database is currently being searched once the user moves past the opening screen. All the examples are for searches in the Grants database.

The opening screen gives the user two options for searching: Quick Search and Enhanced Search. Quick Search provides easy-to-use menu-driven search software that allows users to enter searches in field-limited boxes. The searchable fields include grant maker; recipient; recipient's city, state, or country; grant amount; and descriptions. Quick Search also allows the use of either right or left truncation in the text fields. Each of the fields can be browsed alphabetically, and multiple terms can be highlighted for searching. If multiple terms are highlighted, the system will connect them with an "or" displayed in a window above the search. This is an excellent feature that gives the user a list of all the terms highlighted. However, the browsing software does not allow the user to jump alphabetically. The user must scroll through the list alphabetically to get to the grant maker U.S. West, for example.

Quick Search will allow the novice user to construct very complex searches quickly and easily. For example, a user may want to find a list of organizations that gave a grant for at least $10,000 to the arts in the State of Colorado. Moving through the Quick Search menu, one could easily conduct such a search. Searching by grant amount is an especially powerful feature. Novice searchers often have difficulty searching numerical fields when faced with mathematical operators such as =, >, or <. The Grants Guide provides a relatively easy method of qualifying the numerical search without using these operators. A search using the grant amount field does slow a complex search appreciably. During a test with the CD-ROM database, a search on the subject heading "computers and grants awards greater than or equal to $20,000" took approximately fifteen minutes to search. However, the software will allow the searcher to stop a search in progress with the Esc key.

The majority of both experienced and novice searchers will find Quick Search to be powerful enough for most searches. Nonetheless, Enhanced Search is for the more sophisticated searcher who already understands Boolean logic. Enhanced Search will allow the searcher to use Boolean logic in a search line rather than work through a menu. In addition to the Boolean operators AND, OR, and NOT, Enhanced Search uses ADJ for immediate adjacency, NEAR for adjacency in any order, SAME for words in the same field, and NOTSAME for words in different fields. It is difficult to search multiple words in different fields using the Enhanced mode. However, the software does allow searching all text fields at one time. Most searchers may find searching all text fields to be the easiest method for entering a complex search.

The Guide to Grants' viewing, printing, and downloading features appear to be the same with either the Quick or Enhanced Search. The Guide to Grants will give a short display with the date the announcement appeared in *The Chronicle of Philanthropy*, the subject of the grant, and the name of the grant maker. By highlighting an entry and pressing Enter, the full record will be displayed. It will allow the user to jump to a specific record number or move down the display with the Enter, PageDown, or + keys. Another feature is the ability to reorganize the default order in which results are displayed. The reorganized list can then be viewed or printed. One feature the software lacks is the ability to mark items on either the short or long display for later printing or

downloading. For those who will be installing the database on a public workstation, the software will allow the user to save files to any drive. The software will not force the user to save files to the floppy drives.

One of the more powerful features of the software is the ability to create a customized report format. The report can be printed or saved as a file to be downloaded later into a program to create mailing labels, for example. Margins, fonts, and page length can be set with a menu, and a one-line header can be printed at the top of each page.

Evaluation

The Chronicle Guide to Grants is an outstanding tool for people trying to determine who gave money to whom. It will appeal to a wide variety of users because of its availability in both disk and CD-ROM versions. An office, such as a foundation, could load the database on a hard drive without the added expense of purchasing a CD-ROM drive. However, CD-ROM is the more convenient version, as the hard drive isn't filled with data, and it isn't necessary to load additional data files onto the hard drive every two months. Quick Search is easy to use, with numerous help windows throughout the software. Enhanced Search is recommended only for the experienced searcher who will be searching the database often. The customized file and print features allow a user to produce lists of potential grantors quickly. Medium-sized to large public libraries and other organizations that appeal to companies and foundations for support will find *The Chronicle Guide to Grants* a worthy purchase.—*Tom Moothart, Science Reference Librarian, Colorado State University*

Book Reviews

Susan B. Harrison, Editor

The Art of Indexing

By Larry S. Bonura. New York: Wiley, 1994. 233p. $26.95 (ISBN 0-471-01449-4).

It has been said that "truth in advertising" is an oxymoron, but what the author and his publishers present to the prospective reader in the title borders on the actionable. The book is not just on indexing (let alone any art of it); it is not even on the indexing of books. As the introduction and chapter 1 show, it is on indexing "technical documents" (p. 4), more specifically "manuals" (a term that is used in the first few chapters much more frequently than "books"), and, as gradually becomes clear when reading further, software manuals in particular. The indexing of periodical articles is not even mentioned.

As is my habit in reviewing books, I browsed first through the index, which is set in a single column, which wastes paper, space, and the time of the reader. Serendipitously, my eye fell on the entry "dingbats, alphabetizing 130." Not knowing what a dingbat was, I turned to page 130 for enlightenment. No dingbats there, nor any hint at alphabetizing methods, but a cryptic line under the heading "Index formats": alphabetic subjects. (Until then, I had not known that subjects themselves could be alphabetic.) In any case, the author says on p. 28 that referring to a nonexisting entry is a "mortal sin," thus condemning himself to hell if he happens to be Catholic. Dingbats, my unabridged dictionary says, are "1. an eccentric, silly, or empty-headed person. 2. dingus. 3. *Print*. An ornamental piece of type for borders, separators, decorations, etc." And "dingus" is defined there as "a gadget, device, or object whose name is unknown or forgotten." So now we know.

Reading on, I was told that the American Society of Indexers "bestows its Wheatley Medal to the best index that it judges meets [*sic*] a basic list of criteria." Never mind the grammar, but that is equivalent to saying that the Apple computer is manufactured by IBM. The Wheatley Medal for the best index of a year is, in fact, awarded by the Society of Indexers in the United Kingdom. The American Society of Indexers annually bestows the H.W. Wilson Award for Excellence in Indexing.

At this point, I ceased reading. At age 74, I must husband my time, not wasting it on trash and balderdash. Readers of this journal who wish to learn how to index are advised to invest in Nancy Mulvany's excellent textbook *Indexing Books* (University of Chicago Press, 1994).—*Hans H. Wellisch, University of Maryland*

Internet Access Providers: An International Resource Directory

By Greg R. Notess. Westport, Conn.: Mecklermedia, 1994. 309p. paper, $30 (ISBN 0-88736-933-2).

Over the past two years, numerous entrepreneurial businesses and organizations have begun marketing economical Internet access through dial-up service. Targeted primarily to individual computer users rather than to organizations, these dial-up connections provide a bundle of applications commonly known as being on the Internet: Gopher, Telnet, e-mail, and FTP (file transfer protocol). Many also offer higher-level serial line Internet protocol (SLIP) and point-to-point protocol (PPP) connections that are intended to permit use of graphical interfaces such as Mosaic and Cello.

The primary focus of *Internet Access Providers: An International Resource Directory* is provision of information concerning ninety-eight dial-up vendors in the United States and thirty-four international vendors that offer fully interactive dial-up Internet access. Each listing consists of the vendor's name, address, types of connections offered, costs, services provided, and system information. These listings are enhanced by indexes that allow would-be shoppers to search by area code and telephone exchange, cost, location, and level of service available. Freenets, various bulletin board systems (BBSs), and commercial e-mail services such as Sprintmail are not listed.

A secondary focus of this directory is a listing of dedicated line Internet providers. These listings consist of company addresses, locations served, and connections available for lease. They are not particularly helpful to those who need to navigate among the competing costs, technical requirements, and licensing issues that need to be addressed in dedicated line vendor selection.

Most of the information contained in this directory was collected and verified in 1993 and for this reason cannot be entirely up-to-date. Similarly, no directory of this nature can be comprehensive since new Internet providers are coming online regularly. However, if future editions of this directory are published, the author should consider fleshing out cost and connectivity information for dedicated line providers and identifying upstream service providers for all the vendors listed.—*John Hammond, North Country Reference and Research Resources Council, Canton, New York*

Internet: Mailing Lists

Ed. Edward T. L. Hardie and Vivian Neou. Englewood Cliffs, N.J.: Prentice-Hall, 1993. 582p. paper, $29 (ISBN 0-13-289661-3).

This volume in the Stanford Research Institute (SRI) Internet Infor-

mation Series is a useful reference tool for navigating the world of Internet mailing or discussion lists. Editors Edward T. L. Hardie and Vivian Neou have compiled summary information on over 800 mailing lists. The authors do not claim that *Internet: Mailing Lists* is an exhaustive treatment of the topic. In the wild frontier of mailing lists, such a book would probably be impossible. Instead, Hardie and Neou have supplied a rich sampling of lists on topics as diverse as DEC computers and dollhouses. The introduction states that the book is intended as a "reference source for users, implementors, designers, and students of the Internet." Anyone familiar with electronic mail should find this book easy to use.

Mailing Lists begins with three brief introductory chapters. The introduction explains what a mailing list is and discusses the differences between moderated, unmoderated, and digest lists. Chapter 2, "How To Join A List," shows the neophyte how to avoid such embarrassments as posting "I want to subscribe" to the entire group. Chapter 3, "Starting Your Own List," provides practical advise in nontechnical language on how to manage a list, and advises the reader to "see your system administrator for details."

Chapter 4 constitutes the main body of the book: "The List Of Lists." The entries are organized alphabetically, by list name. Considering that many lists have names like "L-HCAP" (a list focusing on people with disabilities), an arrangement by subject would be more useful. Each entry is between 50 and 500 words in length, and each provides an e-mail address, contact, list rules (if any), a useful date of last update, and a description of the list's purpose and topic(s). The descriptions are supplied by the list coordinators themselves, so they vary greatly in content and tone. For example, the entry for "DEAD-HEADS" reads, "Mailing list for Grateful Dead music fans who don't have time to read Dead-Flames but want to hear about upcoming shows, ticket availability, ride-sharing, etc." The entries do not contain evaluations or other editorial comment.

The only serious flaw in this book is the limited subject access to the entries. About half of the index is composed of entries by list name, which is unnecessary since the entries are already organized alphabetically. The subject indexing is weak and there are no *see* and *see also* references. A chapter on "Suggested Further Reading" would also have been welcome. Despite the lack of strong subject access, *Mailing Lists* is a very useful and informative book for the Internet veteran or novice, and a useful tool for reference librarians.—*David Burt, The New York Public Library*

The PC Internet Tour Guide: Cruising the Internet the Easy Way

By Michael Fraase. Chapel Hill, N.C.: Ventana, 1994. 350p. includes diskette, paper, $24.95 (ISBN 1-56604-084-1)

The PC Internet Tour Guide, addressed to the novice home user, answers basic questions, offers detailed procedures, and provides helpful software especially useful to this audience. Presented in an appealing and nonintimidating format, the book focuses on electronic mail, file transfer, accessing network news groups, and information browsing. Don't miss the introduction to the book, which briefly covers the entire contents and suggests what one might need and another might skip—depending on his or her expertise and needs. Informative and entertaining sidebars throughout the book offer helpful hints and a variety of Internet anecdotes.

Chapter 1 gives advice on how to get connected legitimately. It provides an especially helpful sample dialogue on what to ask for in an Internet connection, since the conversation will be filled with arcane expressions known and understood only by the local business or university Internet guru to whom one must pay homage to get the connection. It also includes a brief history of the Internet.

Chapter 2 covers physical connections to the Internet; who to talk to and what needs to be done if one's company or organization isn't currently online. It also covers the basics of various kinds of Internet connections, such as serial line Internet protocol (SLIP) and point-to-point protocol (PPP), and explains the advantages of each.

Chapter 3 effectively describes the Internet organization, structure, and protocols, and explains the segments of an Internet address. It also explains "netiquette," or how to act on the Internet, so one isn't chastened on the first try at bulletin board communication. It also explains how to send and receive attached files with bulletin board messages.

Electronic mail (e-mail) is thoroughly covered in chapter 4. For many people, this is the reason that the Internet is so important and useful—instant and universal communication. It also explains "Minuet," an e-mail software program included on the diskette with the book. This topic might have been covered more thoroughly for novice users, as I messed up my autoexec.bat file trying to load it.

Chapter 5, "Network News and News Groups," offers information on reading, posting, and replying to the unlimited numbers of news articles available on the Internet. The chapter shows how to search the news groups and articles effectively using a program called Trumpet, and it includes step-by-step instructions for downloading Trumpet. It

contains a brief discussion on etiquette and an overview of available news groups. This section also covers "flames," which are heated debates and often personal attacks on authors of news group items. In a sidebar, the author explains the proper use of smileys, "which are arrangements of punctuation marks to aid in expression of emotions."

Chapter 6 is titled "Transferring Files." One of the great opportunities provided by the Internet is access to free software, and lots of it. This chapter provides complete instructions on the file transfer protocol (FTP), which lets individuals download this treasure trove to PCs, at least as long as hard disk space holds out. Since downloading unknown software is fraught with the danger of viruses, the author explains how to use the popular SCAN antivirus shareware program.

Gopher is a user-friendly program that provides menus that take the user to information databases all over the country. Chapter 7 tells the user how to travel through the vast network of information efficiently.

Chapter 8 touches on other Internet resources. It introduces the reader to organizations that promote and encourage the use of the Internet, like The Electronic Frontier Foundation (EFF) and the Internet Society. It introduces the reader to several resource-saving devices like Knowbots, Netfind, Network Information Centers, Finger, the Internet Business Pages, Archie, requests for comments (RFCs), FAQs, the World Wide Web (WWW), and other interfaces and information resources.

The book contains a thorough index, glossary, and bibliography. The software diskette contains everything that the would-be user needs to get started on the Internet, including Gopher, Telnet and directory services. UNSLIP, also included on the diskette, is a complete SLIP and modes dialing program that sets the user's modem, dials into a SLIP server, and automatically performs the SLIP log-in process. This book is recommended as a guide for the Internet novice. Experienced users will also pick up a few hints.—*Robert E. Pechin III, DYNIX, An Ameritech Company, Provo, Utah*

Voodoo Unix: Mastery Tips & Masterful Tricks

By Charlie Russel and Sharon Crawford. Chapel Hill, N.C.: Ventana, 1994. 300p. paper, $27.95 (ISBN 1-56604-067-1).

This is an easy-to-read book in a format that presents each major topic as a "tip" and problems as "traps." There are a great many useful tips in this book, but despite the book's subtitle, *Mastery Tips & Masterful Tricks*, much of the book is dedicated to the most elementary points. The book is written with an informal slant that is somewhat annoying because the writers at times take too long to make a point.

Chapter 1 suggests sound rules to follow when selecting a password and goes into what prompt to expect from what shells. It also includes log-on procedures for a Unix system and other topics for beginners. Chapter 2 describes ways of managing files and directories. Chapter 3 covers the *vi* text editor with a few words about some of the other Unix text editors. Chapter 4 covers customizing prompts and using variables. Chapter 5 is titled "Printing Magic." There are, indeed, tips that can almost be considered magical. My favorite tip is how to realign tabs when using columns in a *vi* file. Chapter 6 includes compulsory file piping and redirection tools that are essential to a Unix user. This chapter also explains how to assign a job higher priority than the system default. It also details scheduling jobs: how to move a job to the foreground and how to place jobs in the background.

MS Windows, MAC O/S and OS/2 have taken over the desktop world, and one can only conclude that X-Windows devices will do the same on Unix mainframe and minicomputers. Chapter 7, which is dedicated to X-Windows, is an important introduction into the Unix windowing world. Chapter 9 is similarly important in that it is a good introduction into transferring files from one system to another using FTP (file transfer protocol) and also offers a brief introduction to telneting to other hosts. Chapter 8 offers information on an assortment of file comparison and text manipulation tools. Chapters 10 and 11 go into backing up files and provide more on variables, *Korn* shell math and *awk* and *Perl*—two very useful Unix tools. The book contains a brief appendix on error messages as well as one on other Unix books and a glossary.

A weakness of the book is that at times it assumes that the reader is an experienced Unix user and therefore knows the meaning of *$HOME* and other undefined terms. Elsewhere in the book, the reader is addressed as a novice who doesn't know that he or she will be prompted for a password when first logging in. Additionally, some topics are covered twice to the same depth in different parts of the book, e.g., Host name in *your* prompt is covered as a "tip" on page 76 and is repeated word for word on page 173. Repetition occurs with coverage of the *tee* command on page 115 and again on page 156.

A stale "humor" runs throughout the book about having to make offerings to the system administrator in case you need him or her to do things for your Unix account. It was an ineffective waste of space that could have been used to add to the meager quantity of information covered in each section.

The book would also be more helpful if it relied more on tables; e.g., the section dealing with moving around in *vi* could have been more

informative if the "tips" had been put in tables. Anyone who has read a Unix book will probably feel that this book is superficial when compared with the meatier, to-the-point styles of other Unix books. There isn't a lot in *Voodoo Unix* for the advanced user, and the beginner may find confusion in the authors' assumptions and the way some topics are explained, such as the *crontab file.* Considering its price, one can find a number of better Unix titles to choose from. This book is slim pickings.—*Jose Gonzalez, The New York Public Library*

Other Recent Receipts

Books and Periodicals Online. Ed. Nuchine Nobari. New York: Library Alliance, 1994. 1726p. abs, index, paper, $199 (ISBN 0-96302772-7). An international directory of sources available online and on CD-ROM.

Business and Legal CD-ROMS in Print 1993: An International Guide to CD-ROM and CD-Based Multimedia Products in Business, Economics, Finance, Law and Related Fields. Comp. Regina Rega. Westport, Conn.: Mecklermedia, 1994. 361p. paper, $59.95 (ISBN 0-88736-970-7).

College and Undergraduate Libraries. Vol. 1, no. 1– . New York: Haworth, 1994. paper, $28/yr. individuals, $38/yr. institutions and libraries (ISSN 1069-1316). Published biannually.

Educating for Networking: Building New Partnerships. Network Planning Paper no. 25. Washington D.C.: Library of Congress, 1994. 97p. paper, $20 (ISSN 0160-9742). Proceedings of the Joint Meeting of the Library of Congress Network Advisory Committee and the Association of Library and Information Science Education, June 13–15, 1993.

Ellsworth, Jill H., and Matthew V. Ellsworth. *The Internet Business Book.* New York: Wiley, 1994. 376p. paper, $22.95 (ISBN 0-471-05809-2).

Gilster, Paul. *Finding it on the Internet: The Essential Guide to Archie, Veronica, WAIS, WWW (including Mosaic), and Other Search and Browsing Tools.* New York: Wiley, 1994. 288p. paper, $19.95 (ISBN 0-471-03857-1).

The Internet Homesteader; Series A: Library and Information Science. Vol. 1, No. 1– . April. Albany, N.Y.: State University of New York and SUNY/OCLC Network, 1994. $29/yr. (no ISSN). Monthly. SUNY Office of Library Services, SUNY Plaza, Albany, NY 12246.

John, Nancy R., and Edward J. Valauskas. *The Internet Troubleshooter: Help for The Logged-On and Lost.* Chicago: American Library Assn., 1994. 100p. spiral-bound, paper, $20, $18 ALA members (ISBN 0-8389-0633-8).

Lia, Xia, and Nancy B. Crane. *Electronic Style: A Guide to Citing Electronic Information.* Westport, Conn.: Mecklermedia, 1994. 64p. paper, $14.95 (ISBN 0-88736-909-X).

McClure, Charles R., John Carlo Bertot, and Douglas L. Zweizig. *Public Libraries and the Internet: Study Results, Policy Issues, and Recommendations. National Commission on Libraries and Information Science, Final Report, June 1994.* Washington, D.C.: U.S. National Commission on Libraries and Information Science, 1994. 62p. paper, free (No ISBN).

Morgan, Eric Lease. *WAIS and GOPHER Servers: A Guide for Internet End-Users.* Westport, Conn.: Mecklermedia, 1994. 117p. paper, $30 (ISBN 0-88736-932-4).

OPAC Directory 1994: An Annual Guide to Internet-Accessible Online Public Access Catalogs. Comp. Andrew Shriver, Regina Rega, and Tony Abbott. Westport, Conn.: Mecklermedia, 1994. 231p. paper, $70 (ISBN 0-88736-962-6).

Reference Services Planning in the '90s. Ed. Gail Z. Eckwright and Lori M. Keenan. New York: Haworth, 1994. 222p. $29.95 (ISBN 1-56024-619-7).

Woodsworth, Anne, and Theresa Maylone. *Reinvesting in the Information Job Family: Context, Changes, New Jobs, and Models for Evaluation and Compensation.* Boulder, Colo.: Cause, 1994. 27p. paper, $24, $12 ACRL, CAUSE and CUPA members (no ISBN).

News and Announcements

Joy Barron is LITA/OCLC Minority Scholarship Winner

Joy M. Barron of Indianapolis, Indiana, is the winner of the 1994 LITA/OCLC Minority Scholarship in Library and Information Technology. An African American from the state of Indiana, Barron will be getting her Master of Library Science from Indiana University in Bloomington. The scholarship consists of a $2,500 stipend provided by OCLC, Inc.

Gail Junion-Metz named *LITA Newsletter* Editor

Gail Junion-Metz has been appointed editor of the *LITA Newsletter* for a three-year term starting in fall 1994. Junion-Metz is president of Information Age Consultants, an Internet training firm based in Cleveland, Ohio. She was most recently Staff Training and Development Officer at Cleveland State University where she also served as head of Cataloging and Technical Services.

Issue 59, Volume 16, Number 1 (Winter 1995) will be the first issue of the *LITA Newsletter* under Junion-Metz's editorship. She will also edit the electronic version, *LITANEWS*. Junion-Metz can be reached by phone and fax at (216) 321-0059 and on the Internet at gail@iage.com. Her address is 2574 Charney Road, University Heights, OH 44118.

ALA Committee Requests Input for Report on Library Services for Patrons with Mental Retardation

Nearly two decades ago, an ALA committee developed guidelines for providing library services for persons with mental retardation who were residents of institutions. With the passage of Public Law 94:103 (The Developmental Disabilities Assistance and Bill of Rights Act—1975) and Public Law 94:142 (The Education of All Handicapped Children Act—1975), a major change in services for persons with mental retardation was instituted through deinstitutionalization, mainstreaming, and community living. Additional legislation, culminating with the passage of ADA in 1990 (Americans with Disabilities Act) has sought to increase our society's commitment to include all people with disabilities in the opportunities, programs, and services provided to others in both the private and public sector.

In order to assist public, academic, and other libraries in providing more appropriate and effective services for this very large group of potential patrons, an ALA committee was formed in 1992 through the auspices of ASCLA. At the Miami Annual Conference in June, the Subcommittee reviewed initial drafts of guidelines that are intended to be available by 1995.

The resulting document, *Guidelines for Library Services for Patrons with Mental Retardation*, will provide an historical overview and current trends in services to these patrons, a clear description of both their service and information needs, and guidelines for using outcome measures to evaluate the services.

The subcommittee invites comments and suggestions from all ALA members during the coming year, including stories about libraries' experiences (both successful and unsuccessful programs) in providing services to patrons with mental retardation. For further information, or to share ideas and experiences on this topic, please contact either: Ruth O'Donnell, Cochair State Library of Florida, R. A. Gray Building, Tallahassee, FL 32399-0250; (904) 487-2651; (904) 488-2746 (fax), or Marilyn Irwin, Cochair, Institute for the Study of Developmental Disabilities, 2853 E. 10th St., Bloomington, IN 47408-2601; (812) 855-6508; (812) 855-9630 (fax).

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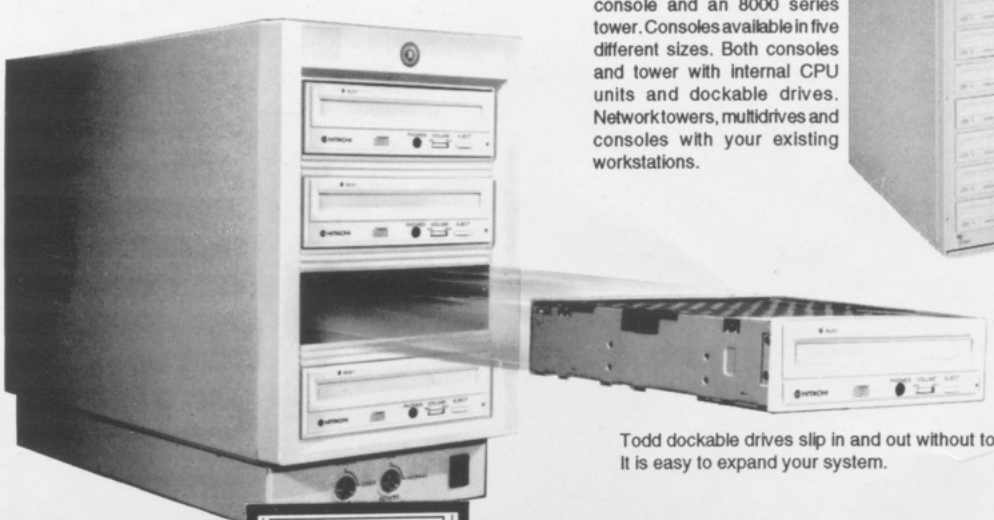

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