Electronic Information Exchange and Its Impact on Libraries

It has become common parlance that we are entering the "Information Age." We would like to take the reader with us on an exploratory voyage to the edge of some current information-age computer technology that may transform the library. A precondition for joining this expedition is an understanding of the "new world" which we hope to discover and build. It is a societal state in which the library has become one of the anchors of what we call "The Network Nation"—an era in which the amalgamation of computers and communications will reduce the time and cost needed to span distances between people and information, and among people communicating, to practically zero.

We are today awash in a sea of information. The library, the journals, the publishers, and the professional societies are segments of the ecological system that populates this ocean. These organisms serve the function of information exchange. One can view the library as a beacon of light to the user; however, if the user no longer sails the waters for which they provide guidance, then libraries lose their function and justification. True, just as for the right whale, one has a certain sentiment for the library; but as humankind has destroyed the right whale so it can allow the extinction of libraries if they no longer serve to light the way. There is nothing sacred about any library, any journal and publisher, or any professional society. If other, more useful mechanisms arise to provide information exchange functions, these entities will disappear unless they adapt to the new ecological environment. Somehow, the barnacles of tradition have to be scraped away.

Following is a description of an alternative technology to provide information exchange. It is not a library or a journal, yet it provides some
of the functions of both. Perhaps someday it will become the heart of a new concept of the term library.

A specific representation of this technology is the Electronic Information Exchange System (EIES) now operating from the New Jersey Institute of Technology (NJIT) with support from the National Science Foundation. We will concentrate on a few of the current applications and facilities which may be relevant to the role libraries and librarians can play in the future.

Some Capabilities of Existing CCS

The term computerized conferencing system (CCS) will be used here to refer to systems structured to create a shared communication space within a computer to be used for the formation, collection, processing and dissemination of information and opinions. What is it like to participate in a CCS? Imagine that you are seated before a computer terminal, similar to an electric typewriter with either a long scroll of typed output or a TV-like screen for display. The terminal is connected to an ordinary telephone. You dial the local number of your packet-switched telephone network service which provides a low-cost link to the computer-host of the conferencing system. You type in a few code words to identify your conferencing system and yourself.

A conferencing system such as EIES will inform you of all of the communications since you last accessed the system that have been directed to you or to the group conference of which you are a part. Then it will lead you through the sending and receiving of text or graphic communication by asking a series of questions and responding to your answers.

There are four main communications capabilities or structures provided within EIES (see Table 1). In addition, there are a multitude of advanced features available.

### TABLE 1. EIES COMMUNICATIONS FEATURES

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<td>Bulletins</td>
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Technological Features for an Electronic Journal: Collection, Submission and Public Access

"The Living Library," a concept attributed to Gaston Berger, suggests that if a subject is little understood or seen as difficult, it is better to spend time discussing it with several experts than to spend it on library research. We propose that the concept of a "living library" is what computerized conferencing is all about. A computerized conferencing system makes it very easy for people to find one another by topic of interest and to exchange their reflections on subjects that are difficult or not well defined. This is not a replacement for the book or journal article, but an improvement of our ability to deal with formulative and transitory information. Libraries have yet to deal with this area in any effective manner, with the exception of collections of working drafts maintained by some company libraries in a research-oriented operation.

During the past three years, EIES has built up a file of conferences on a diverse array of topics. We at NJIT have also observed a range of human behavior patterns reflecting the groups conducting the conferences. Some of these observations indicate future roles for libraries and librarians, if one agrees that libraries should move in the direction of handling formulative and transitory information.

In particular, we noted that certain individuals had developed the habit of copying into their notebooks items from different conferences. This occurred when some topic of interest to them represented a lateral information cut across the various topics defining the conferences they were in. Later, they might utilize this "collection" as the basis for a paper or a completely new conference with other individuals having similar interests.

The pattern of the EIES operation is to utilize observations of this sort to aid and facilitate the users' information behavior through improvements in the design of the system. Therefore, as a result of our observations, we have recently incorporated a lateral information capability called "collections." A collection on EIES works as follows:

1. The user forms an outline on any topic of interest. The outline has a title for each item and there is a 9-level hierarchical numbering scheme using the standard period notation to separate levels, such as 1.2.3. This outline may be modified by the addition of new sections or subsections or by the reordering of items. The user defines a title and abstract for this outline and may have as many different outlines as desired. The user may also designate others he or she wishes to have read and/or write privileges for the outline. The outline represents a rather flexible set of labels for the user's electronic file cabinet.
2. Any time the user encounters some text item that would fit within this outline, a single command may be used to file it at the appropriate location.
3. In line with the philosophy of promoting communications on EIES, the act of collecting an item automatically creates a one-line notice to the author of the item, notifying him or her that the text item was collected, by whom, and under what collection. The author is free to view the abstract of that collection but must get permission from the “collector” to see the actual collection contents.
4. Since the collection really holds only a pointer to an actual item, the author of the particular item is free to edit or delete it at any time. Therefore, the author can pull an item out of a collector’s file if he or she wishes.

Note that a collection could be used merely to allow a person to structure his or her own personal notebook, to organize a paper or a book, or to allow a group to collect everything on a particular topic of common interest. Another key point is that the collection potential is based upon what a person can read rather than just on what he or she has written.

One could well imagine an electronic environment where certain individuals become noted for their ability to collect informative compilations of knowledge and where collections are traded or brokered. We feel that the collection concept represents the transition of EIES from a versatile communications and text-processing system to a more pleasing merger of communication and information systems. The collection also allows a person to perform the same sort of function on the transitory and formulative information composing this system’s data base that a research librarian would perform on the library’s book and paper collection. However, librarians will take on new roles in this type of environment. These roles could span the range from observer, such as the anthropological participant observer, to group facilitator, who guides and organizes discussions. This latter role, of course, implies an entirely new set of talents that must be incorporated into the educational process of future librarians.

Another analogy that has been applied to EIES is that of a blooming and buzzing garden, in which certain individuals play the role of bees, flitting from conference to conference, bringing about the cross-fertilization necessary to trigger new growth in the discussions. Their other function is the high energy or low entropy extraction and production of the honey or collection for the rest of us to feed on, as we now do on good books or papers. The model of the future librarian may well be that of the “busy buzzing bee.”
The collection also makes it possible for an author to "publish" his or her own works electronically and include constant updates in the text. Royalties might be computed by charging a nominal fee per page retrieved by readers, with the computer doing the bookkeeping. Unlike more traditional publishing, readers might directly question the author or comment on the work; these exchanges could be made available to subsequent readers as supplements.

A simpler process than collections is "submissions." Any author can execute a "submit" command identifying the locations of the abstract and pages of his or her paper. The text item that the submission command creates may serve as a message to individuals or be placed in a conference or notebook. Anyone printing out that text item as part of their normal communication process will be presented with the abstract for the paper. The receiver may then execute a "read" command referring to that text item and the whole paper will be printed. This submissions capability in essence opens a window or creates a beacon into the author's notebook that others may look through or be guided to.

The final component necessary for the electronic journal is access or dissemination beyond the limited membership of EIES; that is, to the public. This is provided for by "public slots" which can be accessed by up to 1000 individuals, each with a subaccount.

The Electronic Journal

When we first began design of EIES, we laid out a very specific plan for an "electronic journal." Three years of operation and hundreds of thousands of text pages later, we realize how wrong we were. Our initial thoughts were very much along the lines of mimicking a formal journal and imposing this structure on all "bulletins" or journals on the system. What has evolved, however, is a multitude of alternate subfunctions from which user groups can piece together the type of "journal" operation that satisfies their needs, desires and norms. The scientific user groups can create their own personal "animal" that swims and dives in the manner and style they wish.

The collection capability and the submit and read commands provide the building blocks for the emergence of electronic journals on EIES. There are currently four prototypes in existence or in the development stages.

The simplest is Chimo, a newsletter with items about the members and groups on EIES and new system features. It uses the read feature for its "supplements": full-length papers which have been keyed into EIES by and are made available to its members.
There is also a public conference called Paper Fair which can be considered a totally unrefereed journal. Any member of the system can put a paper into Paper Fair, and any member can read the papers there and enter their reactions or comments into the Paper Fair conference.

A subsystem of EIES called Legitech has been operational since January 1978. Its design is unlike that of traditional journals, but, as will be discussed later in this paper, it provides a similar function.

Finally, under development is the first electronic journal which is similar to existing print-based journals. Its initial issue should be "published" by 1980. It will be a journal for the research specialty known as "mental workload," the study of person/machine interfaces in the operation of complex systems, such as the controls in the pilot's cockpit or in a nuclear plant. This particular specialty area does not now have a print-based journal.

One Example of an Electronic Journal: The Classic Model, with Variations

The electronic journal on mental workload is to be advertised, refereed, edited—just as are traditional journals. The plans are to advertise in wide-circulation print journals, such as Science. Any interested person can subscribe to membership in the journal. Subscribers will receive instructions and access code to dial into EIES on a public-membership slot; markers will be kept on each of the approximately 1000 members expected to be able to share access to a slot.

Anyone signing on under a journal subscriber identification code will not see the regular EIES interface, but will be welcomed to the journal "Mental Workload" (or whatever title is chosen). The subscriber will be asked if he or she wants to read abstracts, search authors or titles, print articles, or comment on articles or the journal system. An editor will preserve the anonymity tradition of journal publishing. When an article is submitted on-line (with the submit command), the editor will assign reviewers, who will have access to the paper without knowing the author's name. Likewise, the reviewers will send their comments to the editor, who will remove the identity of the reviewers before sending the comments to the author.

When an article is in final form and accepted, it will be "published," rather than held for issues at specific times. Another difference from the traditional journal is that all reader comments will be collected and made available to other readers, along with any responses from the author. Such comments on articles can be signed or unsigned.

This is not difficult to do technologically, and will result in a much shorter cycle from completion of research to dissemination of findings, as
well as lower costs, since each reader prints only those articles of interest. The interesting problem is the motivational one. How do you motivate people to take the risk of expending effort to write for and review an electronic journal which has no established prestige-granting rating in the scientific community? For besides serving as official archives of research findings, journals also serve to bestow prestige.

As with new print journals, part of the answer is to try to obtain initial reviewers and authors with established reputations. As of summer 1979, all the software for the electronic journal was in place and working. However, none of the invited authors had actually submitted an article. The technology is here; the norms and reward structures needed to make scientists ready to use the technology have not evolved. As Roistacher points out, another "crucial social aspect of a virtual journal is not merely that scholars submit articles but that they read and cite articles in virtual journals at least as frequently as conventionally published work."1 Even with a potential 1000 "subscribers," relatively few scholars would have access to the journal. The secondary readership of library copies is not likely to occur, unless libraries subscribe and have terminals available for their patrons to access on-line journals.

Legitech: A New Kind of Electronic Information Network

Legitech is the name of a network of approximately forty state science legislation advisors and many federal representatives who are using EIES as an information exchange. It is included in this paper as an example of the "usual" EIES interface and features tailored to users' particular needs to create an information-sharing and access resource.

When the average user of EIES signs on, he or she receives the following "menu" of choices:

ACCESS TO:
MESSAGES (1)
CONFERENCES (2)
NOTEBOOKS (3)
BULLETINS (4)
DIRECTORY (5)
EXPLANATIONS (6)
REVIEWS (7)
COMPOSITION (8)
MONITORING (9)

However, the state science advisors have some very unique kinds of information which they create and share. These are called "inquiries," "responses," "leads," and "technology briefs." Thus, they have customized their own interface on EIES. When a Legitech member signs on, he or she receives the following messages to read and choose among:
A typical set of interactions is shown in Figure 1. As illustrated, a request for information on a topic can result in suggested "leads," such as people or books, or "responses," which are more complete replies. Eventually, each "inquiry" entered will build up its own associated list of leads and responses. Thus, whenever a state advisor has a question, he or she can check EIES to see if there are already any stored answers or leads, and if not, enter it as a new inquiry. One can imagine that a similar structure could be created for interlibrary loan requests, or for "referential consulting networks" for questions which "stump" the local librarian.

When all of the responses have been received, someone often takes the responsibility to edit them into a more polished, integrated "brief" on the topic. These are made available not only on-line, but also by mail. The titles of finished briefs are published in a number of newsletters and made available in hard copy for a small fee. This off-line, secondary distribution thus provides the "mass circulation" that is characteristic of more traditional journals.

FIGURE 1. SAMPLE ITEMS FROM LEGITECH

WELCOME TO LEGITECH.
PLEASE WAIT WHILE YOUR PENDING ITEMS ARE FOUND.

WAITING:
  2 LEADS
  4 RESPONSES
  12 INQUIRIES.

ACCEPT WAITING ITEMS (Y/N)? Y

N74 NP34 PHYLLIS KAHN (PHYLIS, 707) 1/30/79 1:49 AM L:8
KEYS: INQUIRY #34 INFORMATION SERVICES

TOPIC:
INFORMATION SERVICES

QUESTION:
How does your state budget funds for information services and what sort of justification is required for equipment upgrades? Has there been any person or committee paying attention to this aspect of appropriations?
FIGURE 1.—Continued

SELECT ABOVE INQUIRY TO RECEIVE BACKGROUND, RESPONSES, AND LEADS (Y/N)? y

N75 NP47 VERNER R. EKSTROM (OKLEG, 715) 2/8/79 3:10 PM L:17
KEYS: /RESPONSE #47/RESPONSE TO INQUIRY #34/INFORMATION SERVICES/
RESPONSE:
The Data Processing Planning and Management Act of 1971 (Title 74, Sec. 118) provides that several state agencies including all of higher education may maintain their own data processing installations but others may not. For those who have their own they are budgeted out of their appropriations. Others pay for their services from the Division of Data Processing Planning through a revolving fund established by the act. DDPP services over 30 state agencies. A bill has been introduced to expand the scope of the agencies and to provide funding for the development of common systems such as payroll, personnel and inventory systems and to fund the development of systems in agencies not having the capability of doing their own. It is also planned to gain greater control over the development of all systems through the appropriations and budget process and review of state agency data processing programs by the Legislative Council. There is much I could say to elaborate on our program. Please message me further if you would like. Chimo-Verne.

N75 NP53 JOHN BAILEY (726) 2/8/79 9:47 PM L:7
KEYS: /RESPONSE #53/RESPONSE TO INQUIRY #34/INFORMATION SERVICES/
RESPONSE:
Maine has a couple of executive orders on this. The state got burned several times in a row in hardware acquisitions, so the government ordered all state agencies (except the universities) to use the state’s Central Computer Services. There is, in addition to the usual contract review, a special committee that must approve all computer-related acquisitions.

N74 NP 36 JENNIFER BRANDT (JENNIE, 747) 1/31/79 5:21 PM L:11
KEYS: /INQUIRY #36/STATE BILL STATUS SYSTEMS/
TOPIC:
STATE BILL STATUS SYSTEMS
QUESTION:
Are there any state legislatures which have dial-up access to their bill status computer systems? The White House is interested in the possibility of accessing these systems. Is this feasible?

SELECT ABOVE INQUIRY TO RECEIVE BACKGROUND, RESPONSES, AND LEADS (Y/N)? y

BACKGROUND:
The White House information center needs to provide information in response to White House staff inquiries concerning state legislative issues. In the policy analysis and review of pending federal proposals, it would be useful to review pending state legislation.

N76 NP17 GARY NALSON (GARY G., 706) 2/6/79 4:19 PM L:12
KEYS: /LEAD #17/TYE = PERSON/LEAD TO INQUIRY #36/STATE BILL STATUS SYSTEMS/
RESPONSE:
George Reischeck
NYS Secretary of the Senate Staff
New York State Capitol, Albany, NY
George maintains the computer bill tracking system that is used by both houses of NYLEG. They have remote terminals to access system.
Almost Instant Literature Review

When journals and other information sources go electronic, the flood of new publications will undoubtedly make it even harder for people to keep their heads above the oncoming waves of information without a
knowledge-worker's life preserver—the peer review of the importance and quality of new sources. Current book reviews in most scientific fields tend to be a year or two behind the publication date, and many books get only a very short review because of a lack of space. New journals tend not to be reviewed at all, let alone constantly updated or assessed, in locations where possible consumers can gain access to the reviews.

There have been several examples on EIES of "electronic book reviews" which were composed and published shortly after initial distribution of a book. The most interesting form this has taken is the joint or group book review, in which several people critique a new book or journal from different points of view, and the author or editor responds. For example, the new journal Social Networks was reviewed in Chimo approximately a week after it came out, and responses from the journal editor followed the next week.

Such multiple, interactive and quick reviews are potentially invaluable to readers outside a specialty who want to know what possible relevance a publication has for them. Because current reviews are largely done by an author's peer from the same specialty, this is a unique kind of information resource, other than hearing about a book by "word of mouth."

Human Factors and the Automation of Existing Traditions

Often, the initial ideas which people have for use of electronic information exchange technology are to automate exactly the communications conventions and concepts that characterize the traditional media. Thus, for example, we have "electronic mail" systems which refer to "letters," "mailboxes" and even a "postmaster." In actuality, when one mails a letter it cannot be retrieved for modification or even deleted before delivery; after all, once a letter is dropped into a mailbox, there is no way to get it back. Extending this practice to electronic mail serves no useful function.

Likewise, there is no reason an electronic journal needs to have any limitation on the amount of material published, or any fixed publication schedule for new items. Roistacher suggests that the assigning of referee scores can serve the function of assessing quality without preventing publication of articles:

The virtual journal's essential addition to the evaluation process would be that each referee would give an article a numerical score ranging, for instance, from 0 to 100. The referee score would not only allow the virtual journal to publish all papers submitted, but would also allow readers to treat papers as if they were published in a series of journals of differing prestige. Referee scores would be published with the journal's table of contents and
could be used as retrieval items in bibliographic information systems...Low scoring articles would tend to be withdrawn until a satisfactory score is obtained.²

However, before disregarding all conventions made unnecessary by the new technology, one would do well to ask if there is any definite gain for the users in making such an alteration in their habits. There may indeed be some useful functions served by the prevailing practices. For example, the traditional journal or newspaper appears on a regular publication schedule. And, sure enough, our first operational electronic journal, Chimo, does too; it is “published” every Monday.

There was a discussion of whether it was necessary or useful for an electronic journal to be a “periodical” in this sense. Certainly there is no technological need, since one does not have to set up a press run or activate a distribution system to disseminate a new issue; discrete items could be disseminated immediately upon acceptance. However, the habits and motivations of the humans in this communication system seem to support the carry-over of this convention. It appears that both the authors and the editorial board need predictable deadlines; this provides a motivation for them to schedule a definite time within a week to finish their work—that time, of course, is usually right before the deadline. So, while publication weekly rather than continuously might seem to slow the production and dissemination of new items, ironically, this convention actually effects human motivational factors which operate to speed them up. In addition, at least some readers like the predictability of a new issue every Monday morning, waiting on-line. They have stated that it has become something of a ritual, the way reading the Sunday paper is for others. Our generalization is that the design of new systems must take into account the motivations and habits of the people who create and exchange information, not just the technological possibilities.

NEW ROLES FOR LIBRARIES AND LIBRARIANS

Both professionals and the general public need and are seeking better ways to deal with wisdom, lore and raw data. There are many opportunities for the library to develop important new functions and services such as facilitating access to models and becoming key nodes in a network of computer-based resources.

The “personal computer” is now available for less than $1000 and is spawning an avid hobby market. There is little doubt that computer and information technology will flow into the home within the next decade in
forms far beyond that suited to this market. It is very likely that the first major consumer item derived from a general-purpose microcomputer system will be an intelligent typewriter or home word-processing system. With almost no added cost for hardware, such a system will have the capability to serve equally well as a computer terminal, a personal electronic file and notebook system, and an electronic home library. Such a system will have a replaceable memory unit very much like today's "floppy disk" (a storage device), which will hold about 50,000 words and cost about $10. Such a system currently costs about $6000 but is likely to drop to less than $1000 by the mid-1980s. This means that during the 1980s a growing population of individuals and organizations will be able to access directly a wide range of digitally based information and communication services.

The library today is a rather prominent member of the societal fleet of institutions. However, it is beginning to exhibit all the problems of the supertanker, representing a pinnacle of specialized, functional accomplishment and a singularity of purpose that may limit significantly the channels it can navigate and the forms of information it can deliver. Its inertia and size may very well make its turning radius far too large to maneuver in the storms of technological change so rapidly forming on the horizon.

The library is still synonymous with printed forms of information that have a high degree of permanence. However, societal needs for information are beginning to require an ability to handle transitory and raw information.

The Microprocessor as Distiller

In "The Rime of the Ancient Mariner," Coleridge speaks of "Water, water, everywhere, nor any drop to drink." Sometimes the would-be users of data bases and models that are stored on remote computers feel the same way. They are thirsty for the information contained in the potentially accessible data base, but they do not know how to get through the unpotable protocols of an unfamiliar system.

A capability that can be incorporated into a computerized conferencing system is a microprocessor with its own computer-controlled dialer. Programmed to participate as a full-fledged member, it has the same powers of interaction as any human member, and can perform such tasks as linking a user to any data base or model in any computer in a network. The microprocessor linked to EIES is currently called "Hal," but maybe we should rename it "Ahab."

Potentially the most important uses for the library of such a microprocessor are to access data bases such as NTIS, Chemical Abstracts or an
interlibrary loan catalog. The microprocessor has the advantage that the entire protocol for accessing the information, extracting the desired items, and sending the answer to the user can be programmed into it. Thus, the user does not have to remember $N$ different protocols for $N$ different systems, but can be prompted by a series of questions.

This is increasingly important with the proliferation of on-line data bases of potential interest to the library patron. ASIS recently published a directory which lists more than 300 different computer-readable data bases. As Williams pointed out, most on-line systems are now used by intermediaries because of the time needed to gain familiarity with the multiple command languages. The microprocessor, however, can steer the user through such barriers and enable him or her to obtain the desired information without taking up the time of the trained specialist.

When tied to an interlibrary loan request system, the microprocessor might be able to search for an item and automatically send a message to the computer in the library where the book is cataloged to determine whether it is available. If a desired item is located and is available, the system can then be used to send a message requesting that the item be sent.

Referential Consulting Networks

Given the availability in libraries of computer terminals for public access and use, and for on-line searches of computer-based journals and abstract files, a CCS might be used by librarians themselves to form what Manfred Kochen called a "referential consulting network." Kochen argued that since information is now located in many places other than the traditional books and journals under the librarian's care, it is time for the reference librarian to become a general community knowledge resource, an "information-please" professional ready to locate any needed information. For those inquiries that cannot be answered using the resources stored in the local library, a network of reference librarians and "on-call" experts willing to share their knowledge resources might be developed. Every reference librarian is, for some types of questions, an expert consultant. With a system similar to Legitech, the reference librarian unable to find something could enter the item as an inquiry. The answers supplied by others could then be appended to the original request. We have then a new kind of information system, in which the users are also the creators of the information, and of the indexing or key-wording used for its storage and retrieval.
Models as an Information Resource

One of the most potentially valuable resources laying buried in the depths of computers are models that can be used for the analysis of data or for prediction and simulation. Unfortunately, the "lore" on how to run these models has generally made them inaccessible to those who are not in close proximity to the designers. It is as if the model were an elegant ship enclosed in a glass bottle, and nobody but the builder knows how it was done. An operational example of such a model is HUB, designed by the Institute for the Future. To run a modeling program, the user of HUB simply sends a message to the program; part or all of the program can be run and the results entered into a conference transcript to be shared with others.7

The advantage of locating access to a model within a conferencing system is that if any difficulties are encountered in running or interpreting the model, a message can be sent to the designers or documenters detailing the difficulty and asking for instructions or explanations. In addition, one person in a conference system familiar with a particular model or data base is the only one who needs to know the details of access. He or she can set up the programming specifications for the interface. From that point on, any other potential users need only fill out a form provided by the microprocessor or "hub" which asks all the questions needed to access and run.

Riding Out the Copyright Storm

Having used a conferencing system to navigate successfully through the narrow and tricky channels of access to remote data bases and models, the library may find itself tossed about in a storm of controversy over copyrights and data rights, and threatened on all sides by legal barrier reefs.

Since a user in a computer conferencing system can copy the results of a data base search or a run of a model, both of which are shared with others, it is possible for there to be copyright/data right violations. Problems even more severe are introduced when conferencing systems have international membership, thus opening the way for an information flow in violation of the tariff regulations or data protection laws of the sending or receiving nation.8

For example, the "mental workload" journal initially had approximately one-third of its editorial board located in Great Britain. It was supposed to have international contributors and readers as well as editors. However, the British Post Office ruled that it would be illegal for British scientists to participate in EIES, because that would violate its monopoly agreement on the transatlantic transmission of messages. So much for the
new technology; it is prohibited by laws formulated before it existed, and by vested interests in outdated communications technologies.

The merging of communication and information systems, commonly thought to be very divergent, creates new systems that span the gulf between them. On EIES to date we have had not only the exchange of professional information in the form of discussions on topics, but also such activities as job advertising, proposal writing, on-line consulting, drafting of papers, setting of standards, arranging for professional meetings, and so on. There are a number of individuals now performing their consulting tasks through the system. At least two consultants are earning their livelihood via the system. We feel that ultimately the key to the success of these systems is that the writings of an individual or a group be viewed as the property of the individual or group. The EIES environment makes it very easy to conceive of user charges based on material printed which incorporate royalties for the responsible author or group. Such a system would provide the incentive for authors and groups to develop material relevant to the needs of information seekers. In such an environment, the librarian becomes the person who can add value to information by organizing it and facilitating people’s awareness of its existence or relevance. In principle, “librarians” can also receive royalties for such services in addition to those received by the authors. If organized libraries do not act on these innovations, then it is very likely that commercial services will emerge for people who wish to function in this type of environment. In other words, if the libraries do not begin to experiment with this new area of information collection and dissemination, they may lose the opportunity to do so.

These communication/information systems could also create a marketplace for information. It is extremely difficult now, with the current system of publication services dominated by organizations, to establish the worth of any item of information or of a particular author in terms of technical or professional information. The unit of information never gets finer than a collection of papers in a book or journal. We conceive of a future where the unit of information is an individual idea or concept and a bid or barter system can be superimposed on the information exchange process. In fact, one can conceive of a futures market for information which would represent the ultimate stimulus to authors whose writings make up the commodity base.

We have suggested a few ways in which systems like EIES might be used in libraries in the future. The points we would like to stress in conclusion are as follows:

1. Computer technology is now fairly reliable and cheap. A small library network could subscribe to a system such as EIES, or a larger network could have its own dedicated minicomputer-based system.
2. Advanced features and an imbedded programming language in EIES, plus microprocessors, can be used to tailor the interface and capabilities of such systems to the requirements and functions of particular users, such as libraries.

3. There is need for experimentation with such systems to discover what kinds of interface, features, training, documentation and pricing are best suited to specific purposes of libraries.

With a modest investment in field trials and experiments now, library professionals could acquire the skills and knowledge to navigate the computer networks of the 1980s with ease and confidence. The alternative is to wait until a combination of technology, economics and the rising flood of information force the abandonment of current print-based practices, leaving libraries to “sink or swim.”

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