

THE ROLE OF INFORMATION IN THE MODERN AGE

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It has now been 14 years since Daniel Bell predicted the start of a post-industrial society.¹ Although his prediction has not yet been implemented in all parts of the world, the evidence is clear that in the developed countries there has been a decreasing emphasis on the production of goods - through manufacture and farming - and an increase in what has been called the service economies. Those patterns clearly become the model to which less developed countries aspire, and there can be little doubt that what Bell has predicted has come to pass or will come to pass. Only the timetable is in question. For more highly developed countries, predictors and analyzers have now gone one step further, and assert bravely that not only is there a concentration on the service rather than production sector as economies continue to develop and mature, but that beyond this half or better than half of the workers in these countries are now concerned with the broad area of information. Information is indeed broadly defined by these individuals to include all forms of communications, and some of these would not necessarily fall within the framework of this conference and its emphasis. However, even in a narrower framework there can be little doubt of the growth not only of information sources - because a growth in information sources would only be of narrow importance if those sources were not used - but also a tremendous increase in the reliance on information and in the recognition that ultimately it will be

those nations, those corporations, and those individuals with the best capability to analyze and apply information who will succeed.

I am pleased that the sponsors of this conference have assigned me the topic of information without attempting to define or limit what information is, or what forms of communication it excludes. We who work in this field tend to think of the term far too narrowly, and librarians think of it most narrowly of all, in restricting its consideration to formal published sources, most specifically books and journals. Even in published literature any special librarian can attest to the central importance of technical reports, newsletters, memoranda, data bases, and even correspondence. Of course information is not limited to what can be compressed into presentation on a disk or on a printed page of paper. The forms of electronic journalism, and even the most informal communication mechanisms - face to face meetings and telephone conversations - are part of the information process. Indeed, studies undertaken in the United States by such diverse sources as the Rand Corporation and Auerbach Associates in the 1960s concluded that individuals inevitably preferred informal to formal information mechanisms. Their preferred access to information was to consult their own files, then to visit a colleague down the hall, then to call a friend who might know the answer. Derek Price, in his reference to the invisible college, has documented a phenomenon of which we are all

aware.² When individuals turn to the formal information sources, as contained in data bases or in hard copy library materials, it is in one sense because their preferred information gathering techniques have already failed. In considering the questions at this conference I doubt that we can deal with these informal and casual information gathering habits and preferences to any significant degree. And yet, at the same time, it is essential that we remember them, because if we understand one thing it is that information sources, no matter how excellent, will be useless unless they are utilized. Computer professionals attempt to address this problem when they argue for "user-friendly" systems, but their definition, while useful, is immediately far too narrow. It presupposes a willingness of the individual to engage in some sort of formal search as a process. This requires of the person an admission of ignorance, an admission that is never easy, and in some societal structures is most difficult of all. This is a problem that I have seen addressed only rarely - the crucial point that information systems depend for their success on a user admission of ignorance. The developers of user friendly systems also assume a willingness of the individual to do all of this information searching himself or herself, and there is clear evidence that this is not necessarily true. To a great extent information searching, either through a manual search of libraries or a computer search of a terminal, is perceived as a clerical process, to be avoided as beneath one's dignity and one's own sense of

self-importance, and to be delegated or abdicated to a subordinate.

As those of us who consider ourselves information professionals now deal with this complex problem, we must recognize that our success will depend on our ability to adapt what we do to what the ultimate user is able to do, and more importantly is willing to do. Some individuals, without doubt, have developed superb invisible college networks of information exchange with colleagues - over lunch, over the telephone, at professional meetings, and enjoy the process. They will not give it up just because we tell them to, although they might be willing to supplement these sources with whatever else we can provide for them. Other individuals enjoy the process of formal information searching, and want to do as much of it themselves as they can. These individuals are not nearly as numerous as some information systems designers assume, but they do exist, as part of a phenomenon to be discussed later in this paper. Another group of individuals detest the information search process, either because they believe they have more important things to do or because they are made to feel inadequate and stupid by the process, and for us ultimately it is not really necessary to know which is the case. Finally, there are individuals whose use of information sources is severely limited because they simply do not know what to ask, or do not know what an information system might provide.

Our jobs as information professionals is to assist all of these individuals, and ultimately the phrase "user friendly" has a far broader meaning than the design of computer use instructions. It is the process of dealing with each user in terms of that user's needs, but also in recognition of his or her preferences. We know by now, as Calvin Mooers told us many years ago, that the best information system is useless if the people for whom it is designed decline or refuse to utilize it.³

Having defined the problem broadly, let me now seek to narrow it a little so that we can deal with it. Certainly information companies such as AT&T and IBM provide some guidance, and it is important to note first of all that these organizations have long ago stopped calling themselves telephone and computer companies and have adopted the more generic term of information. These organizations, and the many others they represent in what is surely the most rapidly growing industrial development of all, have also recognized the need to support the informal and casual information gathering process. The ability to construct individual files on personal computers, and the increased convenience in telephone technology, are both clearly indications of this.

However, we as information professionals have enough to occupy us even if we, for the most, ignore these narrower and specialized personal approaches to information, and concentrate on the more formal information files, manual or

computerized, accessible through us.

There can be no doubt that we are dealing with a segment that is growing beyond anyone's wildest expectations, indeed even beyond our ability to measure it. The more formal scholarly publication mechanisms give us the most tangible indications, but only make us aware of the fact that we are measuring the tip of an iceberg. Back in 1974 Georges Anderla projected the growth of scientific literature at 8%/year.⁴ If Anderla was correct, then in the 13 ensuing years that literature of science and technology has almost tripled, and if anything librarians challenged to afford this formal segment of scientific literature would argue that Anderla understated the case. At a recent meeting, one publisher stated that in the last five years his company had started 180 new journals while cancelling only 5, and that of course represents only one organization, although a large one, out of a scholarly publisher population that numbers in the thousands. And that is only in scholarly communication, and certainly the growth in other fields, such as business, has been far more rapid. Only ten years ago Martha Williams reported that there were then 300 publicly available data bases, compared to less than 20 in 1965.⁵ How many are there today? Can we even begin to guess as the thousands, or more likely tens of thousands? Dare we project an end to this growth, or even a slowing of this process? Not likely. Similarly, Lee Burchinal, then with the U.S. National Science Foundation, estimately in 1975 one

million on line searches, and predicted a world-wide growth to four million by 1980.⁶ We know that he was understating that growth then much as he thought he was shocking his audience. What is the number for 1987? What will it be for 1997? Futurists tell us that we consistently underestimate what will happen ten years from now, because we tend to frame our projections in terms of known technology and known behavioral patterns, and these will change in some direction as yet to be determined. We face exactly that problem in trying to project information growth and information availability. Surely there can be no doubt that technology will continue to proliferate, and bring us new possibilities. Once we have those possibilities, there will be pressure on us to utilize them, and we can only hope that we utilize them effectively.

Those who have been in this field for some time recognize that our work as information professionals has been largely shaped by developments that came about without us in mind. The use of microform technology in the 1930s was not developed for libraries and information centers, and as late as 1965 the use of microfiche was still severely limited because the various user groups could not agree on a standard of reduction or even on a format for a resulting microform, while an entire industry stood poised to serve this market as soon as it could be sure what that market was. The development of digital computers was not initially for information operations but for accounting, purchasing, and inventory control, but these

large, fast and in one sense stupid machines were ideal for the information process - a process that at least in libraries deals with large files and many relatively simple questions. The use of distributed processing, time sharing and on line access to a centralized file from decentralized terminals came from an attempt to make computers more effective, because the central processing unit was far more rapid than input/output devices. Miniaturization has allowed us to move from large main frames to minicomputers, microcomputers, and personal computers as stand-alone devices and as part of a large system, and cost and size reduction continue under the inevitability of constant competitive pressure. It has been suggested that if the improvements in computer technology had been replicated in the automobile industry, we would now be driving cars that weighed less than an ounce and cost less than one cent, and not even our Japanese colleagues have been able to accomplish this. The changes in computer technology pose both an opportunity and a threat for us, as I will attempt to elaborate later in this paper, but that threat becomes sinister only when we are unable or unwilling to articulate what we want, and rather just take what we are given. Changes in computer technology even alter their own profession. Twenty years ago, when I was managing large national information files, there was a considerable emphasis on careful and elegant programming to conserve computer memory always in short supply in our configurations. That is a problem no longer. When we run short of memory, we simply add some more,

because it is very cheap. Programming is now fast, simple, and sloppy - and correctly so.

I could go on to list some of the other capabilities available to us - satellite and telephone transmittal of hard copy, computer graphics and computer art in multiple colors, the availability of CD ROM technology and file downloading to allow us to develop small and personalized data bases out of large and impersonal ones - but at some point these examples become redundant and this paper has limitations of time and space. You certainly accept the premise I have presented - that our progress as information professionals is not really limited by the tools or toys that the industry has given us, but by a lack of an overall strategy of what want to do with them.

Our use of information tools in service to a whole range of client communities - business decision makers, government planners, manufacturing engineers, agricultural specialists, military strategists, sportsmen and recreation specialists, artists and musicians - present us with a new range of problems, problems of which those with new hardware designs on the drawing boards are totally oblivious. A very incomplete list would include the following:

1. Information at this point is individually prepared and packaged. It is inconsistent in format and in coverage (giving us both gaps and duplication), and it creates problems of

interchangeability between hardware configurations and software packages.

2. Information has a cost, and we recognize that the information itself, and the software with which to manipulate it, are far more expensive than the hardware on which we store it. Many if not most of us have at some point been convinced to invest in the hardware, and yet the hardware becomes rapidly obsolete, even as we still endeavor to pay for it. The rapid dynamism of this process also has severe international implications. Rich countries get information richer, the poor get poorer even as they struggle to spend more in relative terms, and the gaps widen. And, yet, this process cannot be stopped even if some were to argue that it should be stopped.

3. Information access is still limited by barriers of language interchange. Forty years of effort have not yet produced completely successful programs for machine translation, and although we are getting better idiomatic problems still keep us from being good. Nowhere is this isolation clearer than in the United States. Americans, perhaps because of geographic distance and perhaps because of the confidence that everything will be written in English sooner or later, are disastrously unilingual. In an example of the phenomenon already described by Calvin Mooers, individuals who find that accessing important information is simply too much trouble will pretend that it does not exist.

4. There are political barriers to the communication of information. Some of these are international, some are

intranational. There is really no need to examine this issue at this meeting, but it is important to acknowledge that this problem exists.

5. Closely tied to this is the issue of disinformation, the conscious use of the mechanisms so conveniently provided to furnish lots of information - only it is wrong - willfully and deliberately.

6. The related problem of having access to a great deal of information - information access in abundance - is information overload. The information process can be as easily distorted by strangling it through overfeeding as by starving it. Users are quite correctly concerned when information professionals suggest more available information sources, because they haven't yet been able to examine what we gave them last month. As important as the issue of what we provide for our users is the issue of what we consciously do not provide for them. While this issue is directly applicable in a computer environment, it has always been known even in the traditional library environment. Operations research analysts told us a long time ago that it is easier to find something in a small file than in a large file. When library patrons in academia remove material from the library to store indefinitely in their offices they are simply applying instinctively what operations research specialists know. They are creating a small file, in their own offices. Data base access has potential for this same problem, and downloading is at least one of the solutions.

7. Finally, the complexity of the world in which we live forces decision makers to deal increasingly with interdisciplinary data bases, including work in areas in which they were not academically prepared. Pollution, nutrition, population control, space exploration -these are just some of the interdisciplinary issues that we face. Such issues are difficult to address in narrowly oriented data bases - and the results are difficult to understand and use even when once searched.

This wide range of information issues and user preferences suggests that we as information professionals cannot impose a unilateral solution, because no such solution can possibly work. It is rather our task to help the user identify his or her information need, and then to help identify strategies for dealing with that need. Even that very simple statement hides a tremendous amount of complexity. What is it that the user needs? Is it simply what the user wants, or thinks he needs? Or is it, even more simplistically, the further filtering of the request into what the user thinks it is "reasonable" to request? These approaches will not get us to identifying and fulfilling needs, only to revalidating old and sterile superstitions.

The important new role that all of this suggests is that of the information intermediary, a person probably educated in one or more subject disciplines, a person familiar with

computers and what they can do, but a person whose specific contribution is in information. These are not research scholars who have a vast knowledge of a tiny fragment of the world, nor are they bibliophiles who love dusty old books. Nor are they computer specialists who understand what machines can do, but not necessarily what should do, nor graduates of business administration programs who can measure the financial impact but don't understand the process. The responsibility of tomorrow's information professionals is the gathering, processing, analysis, dissemination and application of information, and information as we already know is not uniquely tied to any one format. Information intermediaries must have interactive people skills, not only because individuals have different preferences about what they want to do themselves and what they want the intermediary to do, but also because we must assure some of these now rather hesitant requestors that there is no disgrace in asking, and that the problem of finding an answer can be ours rather than theirs, if that is what they prefer. Herbert Brinberg, speaking at a meeting of the International Federation for Documentation, made a clear case for differentiating information users and their styles and preferences.⁷ Researchers, Brinberg argued, sought raw information for analysis. Engineers sought answers to specific questions, while managers required neither of these but rather an indication of available options. Brinberg's example suggests enough complication, because there is yet more, because these are not the only kinds of

information users (there is, for example, also education and recreation), and because the same user may have different values in different settings.

Libraries are known for developing techniques for self service, through bibliographic instruction, pathfinders, and end user training. These are not important techniques WHERE THEY ARE APPROPRIATE. They are totally inappropriate when we impose our value system to override what the user needs. The problem is not moral, it is pragmatic. It was suggested many years ago that our appropriate role is to take the burden off the user's back, and to assume the tension of the information process. That advice was wise even when presented in the absence of the multitude of information options now available to us. It is even wiser today.

Technology becomes our servant rather than our master when we remember to tell it what we want, rather than have it tell us what it can provide. Peter Drucker probably put it most succinctly and directly. Automation, he argued, is not about machines. It is about how people work.⁸ And this is also true of information technology.

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