W. DAVID PENNIMAN*

Libraries and Information Systems Director
AT&T Bell Laboratories
Murray Hill, New Jersey

Walking Your Talk: Why Information Managers are Not High Tech

ABSTRACT

This paper discusses the role of technology in creating successful information services, and also the important role of *people* in creating successful implementations of new technologies. Much has been written about the areas of artificial intelligence and expert systems. This paper will try to stay on a broader level, its ideas applying to a wide range of technologies, well beyond the traditional library arena. Although most readers of these proceedings are concerned with information management within the library context, libraries provide an environment well suited for a more general discussion about change and the role of technology in introducing change necessary for survival.

INTRODUCTION

Libraries are a curious enigma. Librarians have a long history of dealing with change, but in a schizophrenic way. They cling to the past, and yet they are often the heaviest users of technologies, such as computing and telecommunications resources. Some library leaders are noted for their resistance to change, while others are at the forefront of technologically driven innovations. This phenomenon is not restricted to libraries or librarians. Many computer center managers are still clinging to the concept of centralized computing facilities, while

*The author is now President, Council on Library Resources, Washington, DC.

others are embracing the reality of decentralized and distributed information processing power.

One historical image of the librarian is taken from a novel about a medieval library, *The Name of the Rose.* The passage reads as follows:

> The library was laid out on a plan which has remained obscure to all over the centuries, and which none of the monks is called upon to know. Only the librarian has received the secret, from the librarian who preceded him, and he communicates it, while still alive, to the assistant librarian, so that death will not take him by surprise and rob the community of that knowledge. Only the librarian has, in addition to that knowledge, the right to move through the labyrinth of the books, he alone knows where to find them and where to replace them. He alone is responsible for their safekeeping. (Eco, 1983, p. 37)

Clearly, what is at issue in this image of the library is control. Elsewhere in these proceedings are comments about who should be in control, the system or the user. My question is broader but equally relevant. Who will control access to information, or to information and information technology in a more modern sense? As long as we use control as a measure of success, managers will not embrace technology that diminishes their control.

THE GROWTH OF INFORMATION TECHNOLOGY

We have seen tremendous changes in information technology in our own lifetimes, but from a broader perspective there have been even more profound changes. We have seen storage technology advance from paper to microfilm to magnetic and optical technology. Where we once could store only a few hundred characters per cubic inch, we can now store billions of characters per cubic inch. Transmission capabilities have made similar startling advances. Communications technology has jumped from fifty words per minute of telegraphy to billions of words per minute via glass fibers, and 100 trillion words per minute is within reach. Processing has gone from hundreds to billions of instructions per second, and parallel processing makes the rate practically limitless. Yet our ability to process all this information is virtually unchanged from the time our ancestors emerged from their caves where they had scrawled primitive symbols on the walls. They could process symbols at about 300 units per minute—and so do we. This limit, and our inability to speed up our own processing capacity, is symbolic of our greatest challenge: How to convert all this information being stored, processed, and transmitted into knowledge that is of use to humans.

Strategic Planning: The Challenge to Information Managers

Our ability to use technology to address this last barrier (the barrier to understanding) is sorely limited—not because we lack technological know-how, but because we lack *strategic* know-how. In a book on the Information Age, the following paragraph appears:

> Millions of telephones, thousands of minicomputers, and miles of optical fiber will not create a golden age of. . . information . . . . People always dream about a better future, and our social system encourages this imaginative dreaming. The information society is one such social dream . . . . When discussing a possible better future, we must argue in social, not primarily technological terms. To make that future a reality we have to act in social, not technological terms. (Qvortrup, 1987, p. 134)

When we deal with issues of change, we are dealing with strategic social issues, not technological ones. Paul Strassmann (1985), former vice president of Xerox, agrees. In his book *Information Payoff,* he argues for the pre-eminence of strategy over organizational structure or technology. He states that technology and organization are enablers, but that strategic goal seeking, positioning, and discovery of new "islands" where one can survive are what really make the difference. This calls for a brand of leadership that is opportunistic, entrepreneurial, and able to change direction rapidly with the changing needs of its customers (yes, customers). We all have customers, and sooner or later their satisfaction with our services and their willingness to continue to support us will determine our survival. This is a broader interpretation of what we call user-driven or user-controlled systems. Coming to grips with this inevitable truth—that our survival depends on satisfying our customers—is surprisingly difficult for many organizations that are, in fact, in the service business. Recognizing that those who make funding decisions are one type of customer, while those who receive our service are another type, is important in establishing our customer performance measures and strategies. (Performance measures will be discussed later in this paper.)

Adjectives such as opportunistic, entrepreneurial, or highly flexible do not characterize most information service managers within large institutions, nor do they characterize most library leaders. We have developed our leaders to provide stability and consistency via a centralization of control—to preserve an empire, be it the library, or the computer center, or the management information system. Whenever a new technology threatens to diminish control, it will not succeed on its own merits alone. Pat Battin (1984) has said: "One of the most powerful deterrents to change in conservative institutions . . . is the existence of strong, autonomous, vested interests and the fear of losing one's empire" (p. 170). As long as that empire is measured on the basis of assets controlled (as it is in many libraries, computer centers, or

other information service organizations), change will not be embraced, and technology will not be used where it is seen to diminish those assets.

Accountability

The problem is one of motivation, and the problem of motivation rests with how information service providers of today and tomorrow will be measured. For what will they be held accountable? If they continue to be measured on the basis of the size of their stacks, the number of staff reporting to them, or the number of databases under their direct control, there will continue to be static, nonresponsive organizations that fail to serve their customers as fully as they could. The leaders of these services will talk technology, but be thinking about control of assets. These leaders will be skeptical of new information technology, because they are seldom rewarded for increased productivity—especially if it leads to a decrease in their assets, against which their value is judged. So the way we measure success for our information service providers must be changed. With the correct measures, we will encourage them to use technology that holds real promise for drastic re-engineering of their enterprise. F. W. Lancaster (1982) says: "The survival of the library profession depends on its ability and willingness to change its emphasis and image" (pp. 169-70). This author proposes to accomplish that, and to increase the successful use of technological innovation in ways that really—literally—count. Douglas Metzler, in the opening paper in these proceedings, writes that a fundamental change in the library will come from a change of materials in the library. I believe change will come from a more fundamental issue.

A NEW PHILOSOPHY OF INFORMATION LEADERSHIP

Immeasurable vs. Measurable Value Approaches

Information service providers must make a decision. They must choose a new philosophy of information service leadership (Penniman, 1987a). The traditional view is that information organizations are institutions providing service of immeasurable value. Most libraries function under this philosophy. Some MIS facilities do also. Fewer computer centers do, but many are still funded as if they believe this "immeasurable value" philosophy. No commercial information services operate under this philosophy for long. As the overhead costs of information services come under the magnifying glass, this philosophy will cease to be viable.

The alternative philosophy is that every information service/product has a measurable value. The value of a service may be its selection over a competing service when the unit costs of both are made explicit. However it is computed, it needs to be made explicit, or the value may be the lost opportunity cost if the service is not maintained. Charles Fenly suggests, earlier in these proceedings, that an expert system could be used to extend the reach of scarce expert resources and also extend their impact beyond their term of employment. He questions, however, if this benefit could be quantified. Designers of expert systems must address this issue and choose between two approaches.

First, in the immeasurable value approach, information services are justified on qualitative assertions. Resources required are quantified (i.e., budgets), but output measures are de-emphasized (instead, "value" is measured by volumes held or size of budget). The link between mission and output is subjective, and productivity is not (and cannot) be measured. Budgets grow or shrink incrementally (e.g., cut budget by 10 percent) and accountability focuses on resources used. Expenditures on AI projects, for example, must be taken as a matter of faith—not as an investment in the future.

In the second approach, the measured value approach, organizations are justified by quantitative assertions (i.e., improved reference service productivity by 20 percent, provided a return on investment of 35 percent, decreased cataloging expense by 20 percent while holding output constant). Resources required are quantified, but so is output, and productivity is measured. The link between mission and output is objective, and budgets can include individual program values so that decisions are made on the basis of program benefits. Accountability focuses on input *and* output measures. This second approach has serious implications for the infrastructure of an organization. It moves that organization and its services into the mainstream of the broader community in which it resides. It positions the library, for example, as a delivery mechanism rather than a warehouse, with an emphasis on output, not assets. It moves library leaders closer to key decision makers who understand this type of quantification, and closer to MIS and computer center managers. It moves investment on new technologies out of the faith realm. It also increases the potential for power struggles (every benefit has its cost).

Consistent with this second philosophy is the idea that every information service organization should have a clear mission, vision, set of goals, objectives, and strategies to achieve those goals and objectives with measurable results. Metzler writes at the outset of these proceedings that a quality of intelligent organisms is goal seeking and environmental interpretation. Indeed, planning must be part of every intelligent leader's standard operating environment, and technology should be viewed as

a key component for achieving the mission and vision of the organization—or it should not be considered.

How the AT&T Library Network Uses the Measurable Value Approach

The vision of the AT&T Library Network, for example, is

> to provide all professional employees throughout AT&T with an electronic window to the vast array of internal and external information services and to assure that the underlying information resources are managed as strategic assets providing a competitive advantage to AT&T. [Our mission is] to provide technical, business, and marketplace information needed by individuals and groups throughout AT&T at competitive cost.

These two concepts together—what we do (our mission) and what we wish to be (our vision)—give us the direction to make choices about appropriate technologies including where we will invest a limited capital budget. Strategic assets, quantification of results, or return on investment are business terms. Libraries must embrace not only such terminology, but also the underlying philosophy of business if we are to survive or, better still, thrive in today's environment. For libraries operate in a competitive environment where scarce resources are allocated by institutional decision makers on the basis of perceived value. Library leaders need not only a dedication to the services they provide, but also a willingness to compete for resources on the same terms as other information-oriented organizations. Computing centers learned long ago to understand their unit costs of their services and to argue in terms of return on investment. Libraries must do the same. This will require librarians to challenge the most fundamental philosophies of leadership in our profession.

Recently, the AT&T Library Network funded a study of the value of its services. This study showed a return on investment of between 400 and 1,000 percent (in line with office automation results, but still so high that many managers don't believe the real leverage of information services). In the area of AI, one could expect the same return on investment for an effective reference support system that reduced the need for on-site reference support, especially with an increasingly dispersed customer base. If one thinks of the return on investment of the technologies discussed in these proceedings, it becomes clear that responding to that challenge is essential.

The Myth of Technological Predestination

Changing the measures of success for information services and service leaders is necessary but not sufficient. Changing their philosophy of management to a more business-oriented one, in which strategic

direction and vision play a major role, is also necessary but not sufficient. Major responsibility must also rest with the technology developers. They must recognize that a technology by itself does not succeed.

Little evidence supports the phenomenon of technological predestination. For example, in a study conducted for the National Science Foundation of over 100 information service innovations that failed to reach the marketplace, over 70 percent of the failures were attributed to factors other than technology—factors including management, marketing, and finance (Sweezy & Hopper, 1975). That study, as well as the author's own experience, indicate the need for an activist or interventionist model of change, not one of technological predestination, which is far too passive a view.

A MODEL FOR CHANGE

It is not nearly enough to wait for technology. Both the developers and the embracers of a new technology must understand the conditions for successful use of that technology. Just as there are studies of the failure of innovation, there are also studies of the successful implementation of innovation (Cohen et al., 1979; Dutton & Starbuck, 1979). The findings of these studies point the way and indicate the conditions necessary for success:

1. There must be an understanding of the technology in terms of its advantages over other technologies already available. This understanding must include a thorough knowledge of costs and the relation to processes already in use.
2. Feasibility demonstrations are necessary but not sufficient. Such demonstrations help to identify shortcomings and give early warning signals where improvements are needed.
3. Advocates or champions are needed among both the producers and user groups to assure that early obstacles do not become permanent barriers.
4. External pressures, such as competition and other threats, help to stimulate the implementation process.
5. Joint programs involving multiple organizations provide a broader base of support for the innovation in its early stages.
6. Availability of adequate capital is essential and must not be taken for granted. Ideas do not sell themselves; they require constant attention, and that requires capital.
7. Visibility of consequences is a strong motivator to avoid failure. Announcing publicly an objective makes it more difficult to turn away from that objective.

8. Social support is often a key element and may involve organizations that can provide moral, if not financial, support.
9. Promotional agents, such as the press or other public relations groups, can help to assure that all affected parties understand the technology and how it will benefit them. Such agents also help to elevate the visibility of consequences (see item 7).

These factors lead to a model for change that incorporates two types of bridges between the present and the desired future (Penniman, 1987b). First is a retrospective bridge, or feedback, that compares what we said we wanted with what we have accomplished thus far (i.e., accountability). Second is a forward-acting bridge that is based on intervention, i.e., making the future develop according to our wishes, not someone else's. What ties these two bridges together (accountability and intervention) is an analysis of our successes and failures and a sharing of our experience openly with one another. In the *Journal of the American Society for Information Science (JASIS)*, an article by two other librarians, Lucier and Dooley (1985), states:

> Library administrators have the responsibility to create organizational climates that encourage and promote change. Traditional committee structures are an insufficient approach to anticipate and meet the challenges. Experimentation is essential, improvisation inevitable, and the sharing of both successes and failures a professional and organizational imperative. The great responsibility, however, rests with the individual who must adapt, and adopt the idea of continual change as a goal and a mode of both personal and organizational operation. (p. 47)

We need to learn how to create "learning organizations"; i.e., organizations that treat every effort, every group, every program as an opportunity to share experience and to learn from that experience. That is a challenge for technology developers as well as information service managers. Managers are not high-tech in many cases because they cannot afford to make a mistake, and system developers display a curiously dispassionate view of their systems when things go awry. They are often great at analysis and intervention but fall short on accountability. Managers, on the other hand, are oppressed by the qualitative type of accountability of the past and could actually benefit from the more quantitative analysis that systems designers can offer.

One way system developers can demonstrate a sense of accountability is to demonstrate an in-depth understanding of the full range of conditions necessary for success. They must not only understand those conditions but also be willing to help create them. Having a deep knowledge of the technology is not enough. Developers must also have a deep knowledge of the total environment they are dealing with and the likely conditions that lead to failure or success in that environment.

If the technologists really want to see high-tech information service managers, they must help create them. They must help those managers see how the technology fits into long-range strategic objectives. They must also provide some technologies that support near-term tactical needs (to buy the time necessary for grander plans).

At the 1988 Clinic on Library Applications of Data Processing, *Design and Evaluation of Computer/Human Interfaces* (Siegel, 1991), this author quoted a ten-year-old paper (Penniman, 1979) that argued for system boundaries that recognized the viewpoint of the user—not the systems designer. It was also argued that the "system" boundary should encompass not only the search system and the document delivery system, but also the education system (for users, intermediaries, and designers), the bureaucratic system, and the economic system in which they reside. At the very least (to quote from the 1979 paper), system providers must:

- understand the total system;
- respond to fundamental user requirements;
- use appropriate technology (not necessarily the most advanced technology which, of course, is of most interest to the technologist); and
- establish links with other system components (such as document production systems and document delivery systems).

Now, more than ever, it is essential to establish links with economic and bureaucratic systems with which we must deal. In a report titled "Managing Emerging Information Technology" (Witter, 1986), a similar philosophy is brought home with a checklist that has been modified for this paper. It is presented as a cautionary list, to be considered jointly by technologists and information service managers to avoid the pitfalls that such promising technologies as AI and expert systems might have.

Rules for Failure

To fail, developers or managers need only follow these simple rules:

- Allow too many bright people, who are fascinated with gadgets and removed from the reality of the information service business, to dominate the scene.
- Choose a leader who is very technically oriented and cannot provide a consistent (strategic) focus for his/her staff or cannot communicate well with senior management.
- Operate without clearly defined and measurable performance expectations for either the technical or managerial staff (does that sound like the previously mentioned "measurable value" approach?).

- Ignore or avoid issues such as: cost/benefit analysis, the need for a champion in high places, the impact of the technology on the people in the workplace, or the existing system architecture or other parts of the institution.
- Spend too little time defining the requirements of the information service before selecting one of the latest technologies.
- Ignore the need to weigh trade-offs between choosing a technology now or waiting for better alternatives.

CONCLUSION

It is hoped that this paper has challenged information service managers (and particularly librarians) to be more "business"-oriented in the sense of use of strategies and metrics, and system developers to understand the broader context, in a business sense, in which they are operating. Some reasons have been suggested as to why information service providers may not want to use the latest technologies—even though they may profess great interest in such technology. Finally, some ideas have been presented on where librarians and system designers could work together to avoid some pitfalls.

"Ah," but you say, "I'm not in charge—I'm not the leader. There's little I can do to change how we operate." That is not so; leadership resides anywhere in an organization where there are people with the passion and zeal to take up a vision and to follow that vision to make something happen. The truth is, most effective leaders are servants first (Greenleaf, 1973)—servants to their customers, servants to their institutions, and most important, servants to their vision. If you have a vision of advanced information services in which artificial intelligence and expert systems are a component, and if you want that vision to be a reality, then you must make it happen. You must, therefore, be concerned with the issues raised herein (issues of intervention, analysis, and accountability), and you must "walk your talk" regarding this technology.

REFERENCES

Battin, P. (1984). The library: Center of the restructured university. *College & Research Libraries, 45*(3), 170-176.

Cohen, H.; Keller, S.; & Streeter, D. (1979). The transfer of technology from research to development. *Research Management, 22*(3), 11-17.

Dutton, J. M., & Starbuck, W. H. (1979). Diffusion of an intellectual technology. In K. Krippendorff (Ed.), *Communication and control in society* (pp. 489-511). New York: Gordon and Breach Science Publishers.

Eco, U. (1983). *The name of the rose.* New York: Harcourt, Brace, & Jovanovich.

Greenleaf, R. K. (1973). *The servant as leader.* Newton Center, MA: Robert K. Greenleaf Center.

Lancaster, F. W. (1982). *Libraries and librarians in an age of electronics.* Arlington, VA: Information Resources Press.

Lucier, R. E., & Dooley, J. F. (1985). Cosmology and the changing role of libraries: An analogy and reflections. *Journal of the American Society for Information Science, 36*(1), 44-47.

Penniman, W. D. (1979). Networked databases—A view from the middle. In J. Bichteler (Ed.), *Geoscience information: Publication—processing—management* (Proceedings of the Thirteenth Meeting of the Geoscience Information Society, 22-26 October 1978) (Vol. 9, pp. 39-54). Falls Church, VA: Geoscience Information Society.

Penniman, W. D. (1987a). On their terms—Preparing libraries for a competitive environment. *The Bottom Line, 1*(3), 11-15.

Penniman, W. D. (1987b). Tomorrow's library today. *Special Libraries, 78*(3), 195-205.

Qvortrup, L. (1987). The information age: Ideal and reality. In J. D. Slack & F. Fejes (Eds.), *The ideology of the information age* (pp. 133-145). Norwood, NJ: Ablex.

Siegel, M. A. (Ed.). (1991). *Design and evaluation of computer/human interfaces: Issues for librarians and information scientists* (Papers presented at the 1988 Clinic on Library Applications of Data Processing, 17-19 April 1988). Urbana-Champaign: University of Illinois, Graduate School of Library and Information Science.

Strassmann, P. A. (1985). *Information payoff: The transformation of work in the electronic age.* New York: Free Press.

Sweezy, E. E., & Hopper, J. H. (1975). *Obstacles to innovation in the scientific and technical information services industry* (IPA Monograph 76-2). Washington, DC: Institute for Public Administration. (NTIS No. PB-253 449/3)

Witter, E. D. (1986). *Managing emerging information technology: A decision framework for building competitive advantage* (Business Intelligence Program Rep. No. 738). Menlo Park, CA: SRI International.