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Symposium on Staffing Issues and Public-Access Computer Systems

Edited by Mike Ridley and Charles W. Bailey, Jr.

The introduction and proliferation of public-access computer systems has had a significant impact on staffing in libraries. In an attempt to address staffing issues, The Public-Access Computer Systems Review asked a panel prominent commentators to respond to five questions. The comments of the symposium participants form a detailed assessment of the current issues and provide a diverse set of approaches and recommendations.

Clearly, the central message is that libraries cannot ignore the problem of providing adequate staffing to support public-access computer systems activities. The solution to this problem in each library will reflect its mission, fiscal situation, automation priorities and activities, organizational structure, and managerial philosophy.

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QUESTION 1: Technical support for library automation projects has traditionally been provided by library systems offices, which may perform this work in conjunction with institutional computer services. Systems offices usually have responsibility for the library's integrated system (or separate-function systems), and many systems offices are in technical services divisions.

In recent years, stand-alone CD-ROM databases, networked CD-

ROM systems, locally-mounted databases, remote end-user search systems (e.g., Knowledge Index), and other public-access computer systems have become increasingly common, and some reference departments have begun hiring computer specialists to support these systems. In the future, what should the respective technical support roles of systems staff, institutional computer services staff, and public services staff be in the planning, development, implementation, and support of public-access computer systems? Please consider that certain types of public-access computer systems (e.g., expert and hypermedia systems) usually require local software development.

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Library automation has blurred the lines between librarians and computer experts (or "consultants"). Librarians have taken it upon themselves to become sufficiently computer literate not only to talk intelligently to consultants but also to help users with new technologies. Increased knowledge on the part of librarians becomes necessary because consultants whose offices are not in the library are not accessible for immediate assistance to users. An institutional Computer Services department may be available by telephone or e-mail, but librarians at the reference desk are called upon to help users who have tried to print 3,000 references and do not know how to cancel the print command, whose workstation needs to be re-booted because it has "hung," or who have put the CD-ROM in the floppy disk drive. Immediate help with these relatively simple questions is needed. Problems created for reference librarians by these questions include an expectation of the librarians' expertise and time away from an already busy reference desk.

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A solution is to have consultants hired by and housed in the library to help with these and more advanced questions. As library employees, these consultants are immediately available and can be trained to understand the library's service orientation and policies. These consultants can be supervised by librarians; the librarians know what they want, understand users' needs, and set library policies for the use of computers. A mutual learning process takes place: librarians learn more about computers and consultants learn more about libraries.

In our medium-size academic medical library (staff of 41, including 16 librarians), the role of librarians is to be completely familiar and comfortable with whatever computers are provided for their use as part of their job. Every staff member at our library has a workstation and access to software on the LAN including electronic mail and library files such as serial check-in, book orders, and locally-mounted databases. In addition, Public Services librarians know how to use the CD-ROM products and are experts in searching the databases; they teach users to search. Learning Resources Center librarians are sufficiently computer-literate to help users with basic questions and problems, and they understand emerging technology sufficiently to supervise the consultants and make recommendations for the development of library computer operations. All librarians are encouraged to increase their familiarity with and understanding of microcomputers.

The role of the consultants in our library is to maintain all library hardware (including the LAN), to provide support for users, to help in the training and support of library staff, and to teach classes to users. They maintain close relations with the institutional University Computing Services (UCS). When users want help with their own computers, they are referred to UCS. Similarly, users trying to dial into library services from

their own workstations are helped by UCS; library consultants take over once the connection is made.

In a very large library, full-time programmers may be needed for the OPAC or locally-mounted databases; the programmers may report to Technical Services or there may be a Systems division separate from all others that oversees library operations. Our OPAC and bibliographic databases are operated by a larger university-wide unit that does have programmers and systems experts.

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In summary, in a library such as ours, I advocate both the on-going training of librarians and the hiring by the library of consultants or experts. Microcomputer consultants belong in the library to complement and supplement the assistance given to users by Public Services librarians. They also serve to help librarians and staff with their own computer skills. No matter which library division hires them, they will serve widely to keep library systems and automation projects running and to assist users.

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As the manager of a public services department with a firm commitment to public-access computing, I think we must begin with the understanding that research and reference services are best organized around a group of client-centered experts. Maximizing the effectiveness of these librarians should be the primary organizational goal. We should not let the need to apply technology distort an otherwise appropriate organizational structure.

Support from technically expert staff will be required, but raising the level of computing expertise among all public service librarians should be the prime concern. They are, and will remain, the most important resource in building and servicing electronic scholarly resources on our campuses.

To encourage innovation, public service librarians need to be given equipment, software, and access to training. The materials budgets should be opened to allow the purchase of electronic resources. Entrepreneurial attitudes and activities should be supported and rewarded. This is the only way to create the many small incremental steps needed to integrate the use of electronic resources throughout the university.

A structure designed to move small projects along and to service existing systems will not be suited to large-scale project development, such as OPAC or campus-wide information system implementation. These large-scale projects have been, and will continue to be, managed differently. Planning and development should have input from public services staff, but these projects will require teams from many parts of the library and the computer center. I believe it would be a critical error to build a public service department on the assumption that it will be designing and creating large systems. Public service departments will be developing small systems and encouraging the use of computerized scholarly resources, and they will be assisting users, teaching them, and promoting the use of large systems.

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All librarians must take on more responsibility in understanding computers and electronic formats, be it on mainframes, micros,

or networks. Whether we like it or not, computers have become an integral part of library services, and our level of understanding must be raised. This is not to say that we all must be experts, but we need to have a skill level that enables us to do some basic, on-the-spot support of these systems.

The library's systems staff should provide technical support for planning, developing, and implementing library systems. Some of the specific responsibilities I see for library systems staff in the future are:

- 1) Providing systems analysis services.
- 2) Providing awareness of institutional computing services' short- and long-term plans.
- 3) Evaluating and selecting hardware and software platforms.
- 4) Identifying outside support where applicable.
- 5) Providing disaster recovery plans.
- 6) Identifying commercial products vs. local development.
- 7) Providing local development and staff training for locally developed systems.

I see a limited role for institutional computer services staff. The complexity of library systems and user interface design makes the support role of an institutional computing office very difficult. However, library systems can't operate in a vacuum, and the institutional computing services staff should have such responsibilities such as:

- 1) Providing library systems staff with the institutional computing services short- and long-term computing and telecommunication plans. This would include hardware platforms that are in use and those being considered as well as institutional wiring plans, standards, protocols, topologies, and operating systems that are in use and under consideration.

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- 2) Making documentation and specifications of campus computing services available to library systems staff.
- 3) Working with library systems staff on integration plans.
- 4) Providing support for remote access to and from library systems.

The technical support responsibilities of public services staff should be to provide the users with whatever is needed to use the systems. Their responsibilities must include:

- 1) Training and supporting end users in USE of public-access systems.
- 2) Assisting library systems staff in planning, developing and implementing public-access systems. Public services staff offer a great deal to system prototyping, representing user needs and determining what level of functionality is required for the success of a public-access system.
- 3) Possessing an advanced level of expertise in using application systems and a "basic" level of understanding of the technical aspects of these systems.

- 4) Supporting users with working with hardware (i.e., PCs terminals, printers, and CD-ROMs) and understanding how hardware interfaces with the public-access system (i.e., file transfer, CD-ROM extensions, and printer setups).

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The pace of technological change in libraries and academic institutions makes it difficult to predict what the future roles of the library systems office, the computing center, and the individual library departments will, or should, be in planning, implementing, and supporting public-access systems. To a great extent, the size of the library, the nature of the systems it supports, and the technical expertise of the staff in the library and the computing center will determine the relative responsibilities of the different groups for implementing and maintaining library systems. No theoretical model covers the needs of the general academic library, the multi-unit system, and the specialized health sciences center. Because I am most familiar with academic libraries, my remarks will be almost exclusively directed towards the general academic library.

In recent years, a substantial body of publication has focused upon library/computer center relationships, with a particular emphasis upon whether the institutions will merge or whether one will subsume the other. There have also been some highly publicized mergers and theoretical justifications for reorganizations at specific institutions. Since some of these mergers have been largely based on local political factors, without further research on organizational performance it seems premature to draw any conclusions as to what constitutes an optimum organizational structure for libraries and computing centers.

At Brown University, the organizational structure has been heavily influenced by the Network of Scholars' Workstations Project, described in *College and Research Libraries*, January, 1987. Brown was one of the first academic institutions to implement a campus wide-area network, and the ability to deliver information to offices, classrooms, and dormitories has shaped our thinking. For example, planning for our online catalog was based on the assumption that a major portion of use would be from terminals outside of the Library. Consequently, our online catalog was implemented as a joint project of the Library and Computing & Information Services (CIS), with each organization contributing resources and personnel.

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The partnership initiated by the OPAC implementation has now been formalized in a planning group of the senior staffs from both the Library and CIS. The objective of the group is to define the information resources necessary for Brown University across the next decade, based on the shared acknowledgement that the Library is one of the major information providers on campus and that library resources must be accessible to users on the campus wide-area network. The initiatives for this planning effort came from both the University Librarian and the Vice President for Computing & Information Services.

We hope that one of the by-products of this planning will be a closer working relationship between staff in the Library and staff in CIS, with a concomitant "cross fertilization" of talent which will be beneficial for both organizations. To further these ends, we have begun a series of smaller projects involving the staff of the Library Systems/Planning Office, the Reference

Department, and the technical staff in CIS. For example, a Library/CIS task force is currently investigating the technical issues related to networking CD-ROMs. Similarly, reference librarians will be working with their user services counterparts in CIS to produce a publication that describes "Information Resources at Brown University."

The partnership with CIS also extends to end-user support. Documentation about the library OPAC is posted on the campus academic mainframe and can be printed or displayed by anyone with a mainframe account. OPAC user training is taught by a reference librarian as part of the CIS computer training program. Similar efforts are underway for support of CD-ROMs and other services. Within the Library, the Systems/Planning Office is largely responsible for coordinating the implementation and support of automated systems. The Library Systems/Planning Officer serves as Project Manager for the OPAC, and three FTE programmer/analysts based in CIS (and funded by the Library) report indirectly to him. This organizational structure allows the programmers to participate fully in CIS technical planning, but also to be responsive to Library needs.

The Systems/Planning Office staff includes two systems/planning analysts (librarians), one of whom supports public services and the other of whom supports technical services. Both analysts are expected to work closely with the staff in line departments and in CIS to plan and implement systems. The positions are relatively new and, in some instances, the lines of responsibility are not yet clearly drawn. However, the basic premise is that the systems/planning analysts will provide the technical assistance and consulting needed to enable line departments to support existing systems and to plan and implement new services.

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An important aspect of the systems/planning analysts' work is liaison with CIS. Each of the analysts is responsible for working with staff in CIS on such matters as training library staff on mainframe and workstation software, trouble-shooting problems with the campus wide-area network, and planning for the integration of library information with the campus electronic environment.

One area that has not yet been satisfactorily dealt with is technical support for microcomputers and terminals used by library staff. At present, the Library has over 100 of these devices for a staff of 150 FTE. While CIS provides training in the use of "supported" microcomputer software such as Microsoft Word for the PC and Macintosh, there is also a need in the Library to deal with hardware maintenance issues. The analysts in the Systems/Planning Office currently provide hardware support, but the arrangement is not totally satisfactory. In about a year or so, we plan to have at least one microcomputer support technician based in the Systems/Planning Office.

The organizational model developed at Brown is thus far working satisfactorily, but the success of the model is highly dependent upon the goodwill of staff, particularly at the senior levels of the Library and CIS. Should there be major changes in personnel, it is possible that the Library and CIS would find themselves in competition with one another for resources. How well the model serves us in the future will depend upon the commitment of the individuals involved.

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The question of who will play what role in planning, developing, implementing, and supporting public-access systems may be

more appropriately framed by asking what perspectives will be represented. The institutional setting will often determine where the functions will reside, thus to attempt to determine the "best" scenario is not very fruitful. A more universal series of questions of interest to all types of libraries are: For whom are we designing these systems? Who will provide the best perspectives for ensuring that the design is sound, the ideas will be accepted in the organization, the implementation will go smoothly, support will be continuous and responsive to user needs, and evaluation will be iterative to ensure a constantly evolving product? We can borrow a multiple perspectives approach introduced in the technology assessment field to help us plan, develop, implement, and support our next generation of public-access systems in libraries.

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Linstone [1] presents a multiple perspective model for problem solving in complex organizational and societal settings where technology plays an important role. His model suggests using a team of people each representing three perspectives: Technology, Organizational, and Personal (T + O + P).

The technical perspective is rational and analytic. This perspective uses terms like alternatives, trade-offs, optimization, data, and models: "The United States as a culture is the most strongly T-oriented culture in the world. . . We define quality of life (QOL) in terms of numerical indicators--so that it would be more precise to label it quantity of life." [2] This is the perspective with which most of us working in the field of information technology feel most comfortable.

The organizational perspective views the world from the point of view of affected and affecting organizations. This perspective often distrusts statistics and is concerned that a new policy or change will threaten the organization in some way: "The world seen from the pure O perspective in ideal form is an orderly progression from state to state, with an occasional minor crisis along the way, for which experience and the procedural manual have the answers." [3]

As Linstone [4] states:

In sum, the organizational perspective helps us with sociotechnical systems in at least the following ways:

- * identification of the pressures in support of, and opposition to, the technology;
- * insight into the societal ability to absorb a technology--organizational incrementalism is an important bound;
- * increasing ability to facilitate or retard implementation of technology by understanding how to gain organizational support;
- * drawing forth impacts not apparent with other perspectives, for example, based on realities created within an organization;
- * development of practical policy (for example, new coalitions).

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The organizational perspective may be the most important perspective in insuring that the technical vision is incorporated into the institutional setting. The reference librarians or collection development librarians who have spent a career developing relationships with individual faculty and academic

departments may be in a much better position to represent the organizational perspective than the technical expert.

The personal perspective is the hardest to explain. The "P" perspective is that of the individual's eyes and brain. The personal perspective relies upon intuition, leadership, and self-interest. There are four roles played by the "P" perspective:

- 1) Understanding the total decision process;
- 2) Better understanding of the O perspective;
- 3) Identification of individual characteristics and behavior; and
- 4) Communication of complex problems and issues. [5]

Personal perspectives are often presented by the creative individual, who may or may not have technical expertise, who is able to be objective, does not get bogged down in standard operating procedures (SOPs), and who provides vision and leadership.

It is the power of the three perspectives working in concert that presents the most promise for future public-access library systems. If we attempt to apply the concept of multiple perspectives to the library environment, we could have the "T" perspective represented by the library systems staff and the institutional computer services staff. The "O" perspective may best be represented by members of public services staff, union representatives, or personnel librarians. The "P" perspective may be best represented by end user involvement--a student, a faculty member, a prominent member of the library user community, or a creative and objective librarian. This model does not imply that the team must have three members and three members only, but rather suggests that the combination of perspectives is more important than trying to decide where the "best" place is for the planning, development, implementation, and support functions to reside.

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Nolan [6] suggests that the most effective organizational management of information systems is by committee. He suggests using an executive steering committee to provide direction, rationing of resources, structuring for the effective use of computing facilities, selecting key managers of computing facilities, advising and auditing, and evaluating. As Nolan notes, the committee structure is cumbersome, but it seems to be the most effective way of dealing with decentralization, and public-access systems are by their very nature decentralized.

The multiple perspectives approach is a committee approach. It is suggested here that the T + O + P perspectives be represented on a steering committee and the functions of the committee parallel those suggested by Nolan, with the addition of an important planning component.

This may sound like a "sloppy" management approach, with too much involvement from too many people. In the long run, the time invested in soliciting input from the various perspectives will be rewarded in the design of the end product, the ease of implementation, ongoing management, and the acceptance by the user community. The committee can help to manage the complex tasks of encouraging innovation while maintaining control and efficiency.

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QUESTION 2: Each library is different, but, generally speaking, what organizational structures seem most

appropriate to facilitate the technical support roles identified in the first question? Please speak to the issue of reporting lines. For example, should public and technical services divisions have separate technical support groups? Alternatively, should individual departments have technical support staff? If decentralized technical support efforts are envisioned, how should the efforts of these groups be coordinated? What is the place of temporary project-oriented work groups, which may cross departmental lines, in your scenario?

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Microcomputers are becoming ubiquitous in libraries. Apart from the needs of users, library staff in all divisions are using word processing, database management, and e-mail software. If a library has a LAN, librarians, library assistants, and clerical support staff may all be using the same software. Maintenance of staff hardware is streamlined by providing similar equipment in all divisions. It makes sense, therefore, to have microcomputer consultants who work throughout the library. They may report to a librarian, who in turn reports to Public Services or Learning Resources, but the consultants serve everyone. Requests for their help will be filtered through their supervising librarian.

These consultants may report to Public or Technical Services, Learning Resources, or "Systems"; however, for maximum efficiency, they assist in all divisions. Rather than having Reference, for example, hire its own experts, the consultants will be familiar with overall library computing. They will need a supervisor who screens the questions they receive and organizes their workflow. They will be besieged on all sides and will need a "triage" system to manage their time and ensure that help is provided to those who need it most.

Many public-access products, such as indexes on CD-ROM or interactive learning programs, involve more than one library department. Rather than having one consultant taking care of the LAN and another consultant assisting Public Services with workstations and training, the same consultant can do both.

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"Temporary project-oriented work groups" would operate, in this scenario, through the same supervising librarian. No matter which divisions were affected, one librarian would coordinate workflow and ensure that the work groups were used for maximum efficiency. This supervising librarian could report, as mentioned above, to any division or this person could be separate from existing divisions and report to Administration.

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Public services departments need control over both the resources required for project development and their equipment.

The day-to-day servicing of machines should be provided by a support group within the public services department. Students can monitor equipment and handle paper problems, reboot systems, and change disks. Loading of new versions of software and other routine updating, maintenance, and equipment troubleshooting should be handled within the department. This may require technical staff, but service contracts should be used wherever possible. A service contract on a CD-ROM LAN probably makes more sense than trying to support the hardware with in-house expertise. When these systems fail, a very high level of technical support is required; to maintain this type of person on

staff will be difficult to justify. When a department's need for in-house technical support justifies a position, it should be assigned to the department.

Most libraries will provide some level of technical support within the library organization, usually from a separate support unit. The allocation of these resources and the priorities set will inevitably be the cause of conflict; the results are unlikely to satisfy public service department's needs.

Coordination should be applied administratively and should be given less emphasis than is generally the case, especially for small projects. Innovation at the departmental level is more important than coordination at this stage in the development of public-access computing.

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Outside expertise can also be used in small-scale development projects. Purchasing an expert system to assist in the reference process or a computer-based library instruction package is probably a much better idea than trying to create it yourself. If a department sees the need for many locally developed or modified systems, it may be appropriate to add programming staff to the department--the closer to public service librarians, the better. In most cases, alternatives, such as the use of temporary staff or contracting out programming projects, can and should be found. It will be important to develop working relationships between public service librarians and computer center staff, and to find the means to pay for expert services when they are required.

Large-scale projects will continue to require working groups which include staff from throughout the library and from the computer center. Project management skills will become increasingly important.

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The library systems department should be a separate department that reports directly to the Director. The increasing importance of networking and integration in public-access systems requires a department that can monitor systems needs in each of the library's departments at the same time it prepares an overall systems plan for the library. This overall plan has to be considered in relationship to the institution's computing facilities and services. To separate public services and technical services systems is artificial. Each may require a different view of the system, with different functional requirements, but the two must be planned, developed, and maintained with all aspects under consideration. In the typical scenario of limited resources, priorities and decisions must be made by weighing all departments' computing needs. Each member of the systems department should be designated as a liaison to a specific department or group of departments for providing the following services:

- 1) Assessing departmental computing needs.
- 2) Assisting in determining departmental priorities.
- 3) Identifying the level of systems expertise available in each library department.

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- 4) Steering independent departmental systems development efforts away from incompatibilities with the overall

systems plan so that better system integration is possible.

- 5) Coordinating departmental development with the systems staff as well as with the rest of the staff.

Temporary project-oriented work groups should be just that--temporary. Temporary work groups have a place in planning, developing, and testing only. At the point of implementation, the responsibilities of a work group must already be known to individuals and/or departments whose job descriptions, coordination needs, and support responsibilities are clearly defined.

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As indicated in the response to Question 1, the role of the Library Systems/Planning Office at Brown University is to evaluate the technical feasibility of library plans and to provide guidance and technical support to library departments. Support for computing in the Brown University Library is highly centralized in the Systems/Planning Office, with two systems/planning analysts (librarians) responsible for supporting technical and public services respectively.

This structure was implemented in order to concentrate technical expertise within the Systems/Planning Office and at the same time to provide support for individual departmental needs. While more decentralized models were considered, particularly one that provided a technical support position in the Reference Department, the Library determined that it did not have the personnel resources to support overlapping positions. Because all library departments were using similar technologies and were linked together by the campus wide-area network, technical support positions in individual departments would invariably overlap and compete with those in the Systems/Planning Office. It would be presumptuous to assume that the Brown University Library model of centralized computing support is appropriate for all institutions, but I am persuaded that the model is best able to cope with the increasingly integrated nature of library computing.

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While the focus on PACS-L has been on the public services aspects of computing, it should be kept in mind that our online catalogs are used by the library technical processing units as well. Indeed, one of the major reasons why some systems offices are based in technical services is the initial OPAC focus on loading existing MARC databases. With the implementation of LANs and WANs and the loading of non-MARC databases in our OPACs, there is a need for a single department to take responsibility for library-wide systems planning and support.

With the centralized model there is also the need to encourage individual departments to initiate projects and to assume responsibility for routine departmental work efforts related to computing. The two systems/planning analysts at Brown work closely with the line departments in reviewing departmental computing objectives and in planning for the implementation of new services. In some instances, the analysts play a major role in serving as catalysts for change. The analysts have had previous work experience in either cataloging or reference, so they are familiar with the issues affecting the departmental managers and staff. However, the level of support provided to individual units will depend upon the technical competencies to be found in the departments.

The staff of the Systems/Planning Office is also represented on

all interdepartmental task forces and planning groups appointed to make recommendations on computer-related issues. The Library relies heavily on ad hoc committees and groups appointed to recommend solutions to problems which affect more than one unit or department. A practical example of this relates to the networking of the library CD-ROMs. At the request of the Assistant University Librarian for Public Services, the Systems/Planning Analyst for Public Services is working with CIS to determine the technical feasibility of making the library's CD-ROMs available to the campus WAN. Once the technical feasibility of the project is determined, an ad hoc group reporting to the AUL for Public Services, and including representatives from public services, technical services, and systems, will determine which CD-ROM workstations and databases to network.

A centralized library systems office such as that at Brown University functions most effectively when it reports to the chief operating officer of the library. Placing systems in either public or technical services hinders its ability to provide equitable support to all library units and encourages the proliferation of local technical support groups. As to the appropriate level of the systems office within the library organization (e.g., a division, a department, or a unit), I feel this is largely a local political question.

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A committee approach provides one type of structure for ongoing planning and development of public-access systems, but a committee cannot manage people effectively. There are very practical considerations related to daily operations and reporting lines that must be addressed. The shifts in the needs of organizations as a result of technological change suggest a new approach to creating organizational structures. A matrix reporting structure can be an effective organizational approach to managing staff performing a variety of technical functions.

A core systems staff pared down to the essentials for management, daily operations, and basic technical support functions is my ideal for most library organizations. The systems manager (whatever the title) reports to a senior level administrator who has some understanding of technology.

The small staff has its advantages and disadvantages. The economic advantages are obvious. The primary organizational advantage is that it can open up opportunities for involvement in technical operations from a variety of people outside the systems office. The major disadvantage of a small core staff is that illness, vacations, or maternity leaves can wreak havoc in daily operations and support functions.

A matrix approach brings people into the systems operations from all the user areas of the library. In the matrix model, people report to the person in charge of a particular function for the portion of their job related to that function. For instance, an individual creating bibliographic tools that will eventually be managed by the systems office may be assigned to report to the systems manager for a portion of their work week over a period of time. The person managing the installation and operation of a local area network of CD-ROM products may have a portion of their time allocated to systems.

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A job description is developed for a particular task or function that has been identified as a priority for development. This can

be an iterative process working in concert with the department requesting the development or support, the systems office, and an individual with skills to handle the task or function. One important thing to keep in mind is to make sure there is a clear delineation of both responsibility and accountability. A person is assigned to the job and is relieved of an appropriate amount of work from his or her other assignment. The whole library benefits when we create opportunities for staff from a variety of areas to work closely with systems staff in designing and/or implementing new technology, such as a reference tool to be accessible on a public workstation. Organizationally, a staff member may have as a part of her on-going assignment the development of reference applications on Macintosh computers and the other part of her work day is in the reference department performing traditional reference functions.

Job descriptions are written to reflect the various areas of responsibilities. Reporting may be to two different supervisors for the different functions being performed. Evaluations are done jointly by all the persons having responsibility for a person's work over the period being evaluated. This gives the staff member working in more than one position an opportunity to be evaluated for all of their work. The matrix reporting structure also lessens the stress on a person who might otherwise be reporting to one supervisor for their primary responsibilities and working with other staff on a project outside their regular job description. Without the formal reporting line changes, a staff member may be seen "slacking" off their regular job or not making enough of a time commitment for what may be viewed as "volunteer" work for another department.

The collaborative writing of evaluations has had some side benefits at Brandeis. Supervisors report gaining a greater appreciation for another department's work through discussions with other supervisors about the quantity and quality of work done.

In the matrix model, one can achieve the best of both centralized and decentralized approaches to providing technical support. Coordination, responsibility, and accountability for technical support functions through the systems office is achieved by creating dual reporting lines. Duplication of effort is reduced and centralized training of support staff can be achieved. The decentralization of support staff helps ensure better response to the specific needs of individual departments. Since technical expertise is spread throughout the organization, the overall technical expertise of the library staff increases.

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QUESTION 3: Well-qualified technical staff are difficult to find, they are expensive, and they are hard to retain. What is the best strategy for recruiting and retaining technical support staff for public-access computer systems in terms of required degrees and/or training, required experience, salary incentives (considering equity issues), and career advancement opportunities?

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In Los Angeles, we have had success in recruiting consultants with experience rather than formal degrees; this may have allowed us to pay them less, although we have had job applicants with formal training apply. We have been pleased with the ease with which consultants from a sales or customer support background have adapted to helping faculty and students; they also have superior knowledge of how software has developed and are familiar with a wide range of products. They are paid considerably more than library assistants and only slightly less than entry-level

librarians. In some cases, they could make more working for computer stores or doing private consulting; the advantages of working for us are the lessening of the stress found in the sales arena and the benefits package we offer. Our technical support personnel like the library environment and working with faculty, researchers, and students. They see the university experience as looking good on their future resumes.

Our experience of hiring consultants is only a few years old, so we cannot comment on long-term expectations.

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As stated above, I believe libraries should make every attempt to raise the general level of computer skills possessed by the public services staff, and that, where possible, hardware should be supported with service contracts. For most libraries, development projects are less important than implementing, with only slight modification, systems which can be purchased or acquired from other libraries.

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Such strategies should limit the need for large numbers of technical staff. But, even so, technical staff will be required. The key issue is to define positions clearly and to make sure that the rank and salary is appropriate to the work, and visa versa. Because these positions are new to many libraries and because in many cases the first staff to fill them were self-taught and without credentials, libraries often have trouble getting this right the first time around. Practice should make us better at it.

The credentials required should be those appropriate for the position; there is no reason to insist on an MLS. Salaries paid will need to meet the market. This is not an equity issue. In many cases, technical staff will be paid more than librarians. Librarians need to understand and accept that they will not be the only professionals working in libraries, and, in some cases, they will not be the highest paid.

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The best strategy I see for recruitment in terms of the intangibles is to offer flexible hours and advertise that the systems job includes interesting and varied job duties, research opportunities, and a chance to be in a setting where new technologies and programming opportunities are always under consideration. If you can offer control over a budget, all the better.

Required degrees should include information science or library science with computer science courses. Training in database design, programming, systems analysis, and telecommunications is highly desirable. The library degree is important in understanding the complexity and the "big picture" of what library systems entail. However, if you have systems staff with good library science backgrounds, someone with a computer science degree and/or training may be appropriate. The experience level varies with what you've got already. Someone on the systems staff should have experience with large mainframe or network systems. Most important is that your systems people have the desire to continue to educate themselves and monitor new technologies and programming developments.

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As far as salary incentives are concerned, if you want to retain good technical staff, you have to pay competitive salaries. If your library administrators cannot find a way to offer competitive salaries for both systems and traditional library staff, you can't expect to retain good people. We live in a society where success is measured largely by money, and qualified, ambitious people are going to expect money as a reward. We may find people on occasion that don't require competitive salaries, but we can't keep counting on it. If we can't pay the market price for technical staff, we have to expect that they will only stay on a short-term basis. If you're concerned about equity, expect to get what you pay for.

The advancement opportunities depend on your organizational structure. If you have a systems department reporting to the Director, the head of your systems department would be a high-level position. However, you must accept that there will be turnover. If you can offer technical staff the opportunity to gain experience with a large integrated system or to work with projects that are interesting and challenging, you'll be more likely to recruit good people, but you will have to accept that they will move on, so cover yourself for when they leave.

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Generally speaking, there are three levels of personnel primarily responsible for library technical support: (1) systems librarians/analysts, (2) programmers, and (3) technicians. At Brown, both systems librarians/analysts and programmers provide systems support, and we are planning in the future to hire one or more technicians. We have found that the most important factor in recruiting technical personnel is salary. In several candidate recruitments, the size of the candidate pool was directly related to the salary offered.

The staff in the Systems/Planning Office and the library programmers are on the University's EDP salary scale, which is 10 percent higher than the scale used for comparable non-EDP jobs. Even with this salary differential, it has been difficult to recruit experienced personnel, particularly programmers, because our campus salaries are not fully competitive with those being offered by private industry. The need to pay programmers higher salaries than librarians has not been a major issue. Most of our staff recognize that programmers can generally command higher salaries than librarians at comparable administrative levels.

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At one time, I also believed that having a "state-of-the-art" system was an important inducement to attracting experienced technical personnel. I have found, however, that individuals experienced with third generation systems, such our DBMS system (ADABAS), can often command salaries that are beyond our means. In a recent recruitment for a programmer/analyst manager, we had many candidates who requested higher salaries than we could afford. There have also been times when we had to hire personnel who were not fully experienced with ADABAS, and on those occasions we had to expend considerable sums of money on programmer training. Having a "state-of-the-art" system is thus a two-edged sword.

We do not specifically require an MLS degree for the systems librarians/analysts or a computer science degree for the programmers. The librarian/analyst positions require either an MLS or a degree in computing science. In recruiting for these positions, we felt that we would have a larger candidate pool if we did not have specific degree requirements. While both of the library systems/planning analysts we hired have an MLS, we also recruited a very capable programmer who did not have a bachelor's

degree. I believe that work experience and demonstrated knowledge are more important in systems work than formal degrees. This is particularly true in the programming area where many educational institutions are graduating students who are ill-prepared to work on large and complex mainframe systems.

I really don't have any sage advice concerning career advancement opportunities. In some institutions there will be non-administrative promotional tracks, such as faculty status ranks, which provide for advancement within job grades based upon performance and professional contributions. While librarians at Brown do not have faculty status, a two-track system for librarians enables the librarians in the Systems/Planning Office to be promoted within position.

Programmers, in general, have a greater number of career advancement opportunities than librarians, given the size of the job market and the demand for experienced programmers. In the case of library programmers, this may mean accepting a position on a non-library project. While I regret losing an experienced programmer, I recognize that in order to advance professionally, a programmer may need to accept a position working on another project at Brown University or elsewhere.

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Recruitment and retention of well-qualified staff is a common problem among non-profit organizations. There are no easy answers. For the most part, it is impossible for many of us in libraries to compete with high-tech firms for well-qualified technical staff, so we must compete on a different basis. There are some organizational "quality of work-life" issues that can help in the recruitment and retention of staff. A reputation for flexibility in scheduling, grade and salary levels that reflect responsibility and qualifications, a track record for promoting within an organization, opportunities for educational benefits, and child-care benefits are all important for the modern work force. Individuals who feel they are valued for their contributions and who are given responsibility and independence are going to stay with you longer than those who do not feel appreciated, are not clear about their responsibilities, and feel they are being watched over all the time.

When thinking of recruitment and retention, it is also important to consider in-house training. If an organization develops depth of expertise, the loss of a "star" is not as critical as it is for the organization overly dependent upon a few experts.

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QUESTION 4: In addition to technical support, staff training and end-user instruction play critical roles in the success of public-access computer systems. Who should perform these functions (e.g., library instruction staff, electronic information coordinators, or systems staff), what types of training and instruction seem most useful, and how extensive should these efforts be?

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Staff training is crucial to smooth operation. Staff using microcomputers must have adequate and appropriate training when they are first hired and whenever new software is installed. Classes should be arranged (with division head approval for the

time from work) and one-on-one help provided as necessary. Group instruction is always more efficient, and simple sheets of instructions lessen the calls for one-on-one help. The supervisory librarian described under Question 2 can coordinate these efforts; consultants teach and support staff as well as users. Any innovations, such as a LAN or change in word processing software, should be announced in a non-threatening way. In-house documentation helps and personal attention for those who are less comfortable with computers. Staff input should be encouraged. Requests, complaints, and suggestions should go to the supervising librarian who then organizes the consultants' time and efforts in addressing staff needs.

End-user training involves both bibliographic instruction and computer literacy. As with staff, users are encouraged to come to classes before we offer lengthy one-on-one training sessions. Class hand-outs are designed to help users after class when they try out what they have learned. These classes may be a joint effort of consultants and public services librarians. Teaching searching of online catalogs or locally-mounted databases, for example, is usually done by librarians; however, users who want to dial into these databases from their homes or offices may need the assistance of microcomputer consultants. Users who want to download search results into word processing or database management programs will also benefit from classes or support from consultants. The combined efforts of public services librarians and consultants, coordinated by the supervisory librarian, can form a continuum of training for users that maximizes both.

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End-user instruction is the reference librarian's job. Electronic resources are library resources, and librarians should integrate their use into general and specialized instruction sessions. When responding to a reference query, instruction in the use of an OPAC or a CD-ROM should be provided in the same way instruction is commonly provided to users of printed sources. Supporting remote users is a complication. Part of the problem involves technical issues in negotiating the network. Most campus networks are still largely ad hoc and communications issues can become complex quickly. Reference librarians should know enough to understand the questions, but it should be a computer center function to provide the answers. This problem will lessen as campus networks mature, as standards are applied, and as front-ends are developed.

The second part of supporting remote users is more difficult. This is the intellectual interaction which is the heart of the reference process. How do you do question negotiation over the network? How to you instruct? We don't know much about this now, so the sooner we begin to experiment the better. High-end solutions, such as expert systems and knowbots bear watching, but most of us should begin small with e-mail reference services and bulletin boards. The key to successful library services will be the ability to communicate with our users. Our users are on the network; we need to discover how best to work with them there. Staff training must require both the expectation that increased computing skills are a necessary part of a satisfactory performance and the resources to support the acquisition of the required skills. Public service librarians need to be aware of how to locate data in electronic form in the same way that they are now knowledgeable about printed sources. If they do not, they are not doing their jobs. This will require more computer expertise than many librarians now have, so programs that support the acquisition of these skills are required and should be an administrative priority.

The most effective program will start by putting a machine on every librarian's desk and providing the time required to learn to use it. Formal training, including course work, needs to be encouraged.

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Training for staff should be done by staff members designated from each department who work with the systems liaison to get sufficient training where technical knowledge is necessary. This method can be better coordinated with the department's schedule and turnover rate. It also takes into consideration the level of expertise required for that particular department. I firmly believe that staff training is too large a job and requires too many perspectives to be a responsibility of the systems department.

End-user training and documentation should be provided by library instruction staff. The library instruction staff should be able to consult the systems liaison for clarification of technical issues. There should be point-of-use training provided by documentation as well as by library staff members. There should be classes given ahead of time by library instruction staff. Training and support of users by classes and at point-of-use is one of the areas where libraries provide a great value over competitive information services, and libraries should exploit this advantage. There need to be staff dedicated to identifying and providing the best training and support the library can offer to its patrons.

Systems staff should work in conjunction with library instruction staff to provide common user interfaces, online context-sensitive help, and methods of feedback to determine users' conceptual models of public-access systems.

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What is most important in end-user education is for the trainer to have good teaching skills, to be knowledgeable about the system, and to be familiar with user needs. Hopefully, the trainer will be a member of the reference department or whatever unit is responsible for library instruction programs. But there may be times when the systems office or the computing center staff need to assist reference in instituting training programs or in conducting training sessions.

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Many librarians, both in systems and in reference, may not be fully experienced or comfortable with providing instruction in an electronic environment. In this regard, the local computing center can sometimes be quite helpful. The Brown CIS staff have a strong user education program, and we have relied heavily on their expertise and advice in reaching the "electronic audience." In turn, CIS has benefitted from the Library's knowledge about providing individualized instruction.

Similarly, the User Services staff in CIS and the Library Reference Department share responsibility for answering OPAC questions--terminal emulation and logon questions from dial-in users are referred to CIS; searching questions are referred to Reference. We have found that in a highly distributed electronic environment, the user is not certain about who the primary information provider is or where to go for assistance, and that

all user support groups need to be knowledgeable about their relative responsibilities for answering user questions.

Our OPAC was designed to operate in a networked environment and offers two modes of searching: (1) menu-driven and (2) direct command. Most users are able to master the mechanics of the menus without documentation or instruction. At one time, we tried offering training sessions about the menu system, but discontinued the training because of lack of demand. One of our reference librarians continues to offer direct command training as part of the CIS computer training program. Attendance has been variable, and we have had to learn how to market our services more effectively. Documentation for the menus and command language is posted on the Brown mainframe and is available from the Library literature distribution racks. Most of the documentation was developed by the Systems/Planning Office with the assistance of Reference.

Staff training at the Brown University Library is largely the responsibility of individual departments working with the Systems/Planning Office. Theoretically, the systems/planning analysts train the departmental managers and supervisors, and they in turn train the departmental staff. In practice, the technical and training competencies vary from department to department, and the level of support and training offered by the Systems/Planning Office has had to be adjusted accordingly. Given limited personnel resources, we try to rely upon training expertise wherever it is found. In our initial OPAC implementation, two volunteer trainers from Reference and Cataloging assisted with providing introductory search training to all our staff. A reference librarian continues to provide this training for new staff members library-wide. We also rely upon CIS to provide mainframe and microcomputer training sessions tailored for library staff.

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Brown is thus highly pragmatic in its approach to training and relies upon staff from various library units and CIS to support systems used in the libraries. We have found that no single department or office has the personnel or expertise to provide training support for all the diverse systems we use.

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A multi-faceted approach to staff training and end-user instruction is necessary to address the different ways people learn. [7] Computer-aided instruction, written materials, personal instruction, video, and publications are all important tools for training.

Staff training and end-user instruction should be coordinated through a sub-committee of the technology steering committee. Staff training is probably best done by systems staff or the "extended systems staff." Whoever is training should know the basics of adult education--how to teach adults, what are the motivators to learning, and how to introduce technical skills. It may be necessary to provide separate training sessions for supervisors, depending upon the individuals. It is important to be sensitive to the nuances of the structure of training situations. Individuals representing the organizational and personal perspectives on the steering committee will be helpful in this regard.

End-user instruction is best coordinated through the steering committee with the individuals in charge of user education. End-user instruction is an extension of the various types of library education we present to our users.

QUESTION 5: What other thoughts do you have on the issue of providing adequate staffing to support public-access computer systems?

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At the Norris Medical Library, public access microcomputing has grown gradually and, perhaps, haphazardly over the past few years. Responsibility for online catalogs, bibliographic instruction, software support, and LAN management may be fragmented among library staff. At some point, these efforts need to be centrally coordinated. As these activities may all involve the use of microcomputers and, as described above, they may overlap in content, the most efficient organizational structure brings them together.

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It is important to remember what business we are in. Most libraries are not and should not be in the technology development business. We apply technology; we don't usually invent it. A library is a service organization whose goal is to link students and faculty with the resources; increasingly, these resources will be electronic. Public-access computing in academic libraries is a reality now, but if it is to be applied widely, it will require a large number of public service staff working with schools and departments on many small-scale projects. The organizations we build need to encourage and support this type of innovation.

Public-access computing in libraries currently confronts two organizational conflicts. The first is that the skills possessed by many public service librarians and the skills needed to operate in an electronic environment do not yet match. I believe this will be a short-term problem. Remember that OPACs, microcomputers, CD-ROMs, and electronic mail have become common and accepted parts of library service only in the last several years. My experience has been that staff, given support, adapt remarkably quickly and with surprising ease. It would be a mistake to overreact to the current situation; quick fixes which concentrate skills and responsibilities in the hands (and minds) of a few technical staff or the few librarians who have "taken" to the technology, might be useful in accomplishing a few quick projects, but over the long haul this will be a counterproductive strategy.

The second conflict is that the organizational structures required to implement large-scale projects are different than those that are required to effectively operate the resulting systems. An integrated library system requires a great deal of coordination. Our current need is different; it is to encourage small-scale innovation, both to make incremental improvements in how our big systems are used and to bring electronic resources to scholars and students across the university. In many cases, the latter task will be done one faculty member at a time. To do this well will require a knowledgeable staff willing to take risks and resources which can be used by these staff to apply public-access computer solutions to a wide variety of problems. If these two critical pieces are not in place, the other staffing issues addressed in this symposium will not matter.

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ALL librarians MUST be able to understand more about electronic formats--many do, many do not. Libraries need to develop a way to re-educate their staff to better understand how systems work and to interact with technology.

Because of the complexity and size of library systems, library schools need to start teaching the generic components of computer architectures, including operating systems and their interaction with applications. Library students should be taught more about algorithms and how they affect the efficiency of a database, especially in relationship to bibliographic information. Teaching different programming techniques and concepts that better manipulate information is essential. Most importantly, library schools need to fill the gap in manipulating information with computers. Teaching library students how to use electronic mail, spreadsheets, and relational databases isn't enough. Our field is too complex and challenging to provide such trivial education.

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A personnel issue which is becoming of increasing concern to me is the need to support the growing variety of incompatible technical systems being introduced in library public service units. In our Reference Department, the reference staff are expected to be knowledgeable about our OPAC, RLIN, OCLC, Dialog, BRS, Medline, the Silver Platter CD-ROMs on both the PC and Macintosh, the WilsonDisc CD-ROMs, the Science Citation Index CD-ROM, the Academic Index CD-ROM, e-mail on CMS, a campus electronic bulletin board, and PCs and Macintoshes for staff use. I suspect we are not unique in this regard.

Computing centers can usually deal with the variety of systems which need to be supported by assigning one or more staff members to become experts in a particular system. However, in library public services we seem to be acquiring more equipment and systems than we can handle. While we have tried to standardize on certain devices, the pressures for bringing up the latest vendor products are enormous.

Often, the decision to acquire a particular product is based upon collection development considerations, and the user support issues are secondary. While there is growing recognition here and elsewhere that user support is critical to the successful implementation of an electronic service, we have a ways to go in "institutionalizing" user support as part of the acquisition/collection development process.

The traditional organizational boundaries which have defined technical and public service library staff have been shifting with each new wave of technology. Fragile shorelines change with each succeeding season, and our libraries change with each new technological breakthrough. Organizational boundaries will continue to exist for the foreseeable future, and technological change will continue to exert influence upon the jobs we perform in libraries.

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As the impact of library technology has moved from technical

functions to reference service functions to campus networks and beyond, the scope of concerns addressed by systems staff have broadened. Experience, research, and reflection upon technological change have resulted in the following important insights:

- * Effective planning, implementation, and management of public-access systems are enhanced by a multiple perspectives approach.
- * A matrix reporting structure can be an effective organizational approach to managing staff performing a variety of technical functions.
- * Staff participation in decisions regarding the structure and nature of technological change improves success rates when implementing change.

These insights are not a result of original scholarship, nor are they unique to libraries, but are adapted from other sectors of the economy for application to library organizations.

The following are four suggestions which may be helpful to organizations attempting to provide adequate staffing to support public-access computer systems.

RECOMMENDATION 1: Create a technology steering committee composed of individuals representing technical, organizational and personal perspectives. The functions of the committee are to include: direction, rationing of computer resources, structuring for effective use of computing facilities, selecting key managers of computing facilities, advising, auditing or evaluating, and planning for future technology.

RECOMMENDATION 2: Experiment with the matrix approach combined with the technology steering committee described above. There are specific organizational requirements, whether union or institutional, which must be met for the successful implementation of a matrix reporting structure. The combination of the matrix organizational approach and the technology steering committee can provide a strong cohesive focus to technological management, planning, and development within an organization.

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RECOMMENDATION 3: Understanding of human needs, valuing contributions, providing a good work environment and competitive benefits help in retaining staff. A premium can be paid for expertise, but, if the salaries for technical staff get too far out of alignment with other staff, problems arise. Try to train staff in-house to ensure depth of expertise.

RECOMMENDATION 4: A coordinated approach to staff training and user education is just as important as a coordinated approach to technological planning, development, and management.

Notes

1. Harold A. Linstone, *Multiple Perspectives for Decision Making: Bridging the Gap between Analysis and Action* (New York: North-Holland, 1984).
2. Ibid, 46-47.
3. Ibid, 48.
4. Ibid, 52.
5. Ibid, 57-61.

6. Richard L. Nolan, "Managing Information Systems by Committee," Harvard Business Review 60 (July-August, 1982): 72-79.
7. Sonia Bodi, "Teaching Effectiveness and Bibliographic Instruction: The Relevance of Learning Styles," College & Research Libraries 51, no. 2 (March, 1990): 113-119.

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