
Library Automation, Networking, and Other Online and New Technology Costs in Academic Libraries

MAUREEN PASTINE AND CAROLYN KACENA

ABSTRACT

USING THE COSTS FOR THE library automation activities at Southern Methodist University plus a review of the literature in automation costs and requirements, the authors present some of the hidden as well as obvious budgetary requirements to meet the electronic library needs in small- and medium-sized university libraries today.

INTRODUCTION

Over the past twenty years, academic libraries have changed considerably as bibliographic utilities, online catalogs, automated circulation systems, and other new technologies have been implemented in a majority of library operations and services. These changes have created rising costs for libraries in a time of tight fiscal constraints, particularly in the area of telecommunications, buildings, furniture, and electronic equipment. For the medium and larger sized academic libraries, it is not uncommon for computer costs associated with implementing online catalogs, circulation/reserve, acquisitions accounting, and serials control systems—including retrospective conversion of paper records into machine-readable forms—to require \$5 million plus. Annual maintenance, licensing agreements, software, and hardware requirements will exceed an additional \$250,000 to \$350,000 per year.

Maureen Pastine, Central University Libraries, Southern Methodist University, Dallas, TX 75275-0135

Carolyn Kacena, Library Automation & Information Technologies, Central University Libraries, Fondren Library East 328, Southern Methodist University, Dallas, TX 75275-0135

LIBRARY TRENDS, Vol. 42, No. 3, Winter 1994, pp. 524-36

© 1994 The Board of Trustees, University of Illinois

The increased access to electronic information systems not held locally and to other new technologies such as CD-ROM, laser technologies, interactive multimedia packages, OCR (optical character recognition) and imaging systems, satellite communication and teleconferencing, laptop computers, packet telephone switches, and cellular telephones have also been making an impact in a few libraries along with LANs (local area networks) and WANs (wide area networks) for interconnecting local computing resources.

The impact has not been only on more technologically oriented methods of operations and services; new information and instructional technologies have placed tremendous pressures on outdated cabling and wiring. Expanded budgets are required for such things as asbestos abatement in ceiling and floor tiling as well as utility tunnels; installation of fiber optics and additional connective wiring and cabling within and among buildings; and equipment (hardware and software) for both staff and public access. Additional funding is needed for online network memberships and connections to local, state, regional, national, and international networks. These network relationships require new and expanded licensing agreements with updated copyright procedures and related issues. New formats and access tools require revamped policies and procedures, rules, and regulations. Expanded training (of staff and users) and continuing education require increased travel budgets for participation in new professional associations and continuing education and training opportunities. Employment of new types of personnel to handle technological problems (including troubleshooting of hardware/software problems), programming, and maintenance and repair work, plus retooling of existing staff and enhanced hiring requirements when keyboarding skill (i.e., typing) becomes more important at all levels. The new equipment can focus staff demands for installation of ergonomic furniture and security devices. There are increased costs in HVAC (heating, air conditioning, circulation, and humidity) and other utilities costs (telephone, telefacsimile, electrical power, security and control of equipment, software, building access, and other costs associated with telecommunications and online networking). Reconfiguration and reconstruction of physical facilities both within and outside of library buildings is often necessary. Special consultants to assist with strategic planning, selection of systems, technological issues, and related problems are often hidden costs. The emphasis on equipment increases the need for analysis of depreciation and replacement costs associated with many aspects of new technologies.

In addition to all the new budget-impacting workloads, much greater interaction, collaboration, and cooperation have been required

among librarians, their primary clientele, computer center personnel, physical plant operations, university administration, and others related to telecommunications planning and budgeting of all aspects of informational and instructional technologies.

Fund-raising has become far more commonplace in all types of academic libraries (public and private) than ever before in history—and not just through state and federal granting agencies but through approaches to foundations and corporations, as well as individual benefactors. Priorities have changed; funding methodologies have expanded; resources (budget, personnel, space, equipment, responsibilities) have had to be re-examined and reallocated. All of this requires that far more personnel time be devoted to both short- and long-range planning within libraries, across campus, and often within consortia of a local, state, regional, and even national nature.

The new technologies have required not only different expertise and training requirements for personnel but have required new types of personnel and more personnel, even though shifts in existing personnel could be made to meet new demands when the newer technologies made some activities obsolete and others less labor intensive.

Gaddis (1989) notes that libraries have had to become more involved in soliciting bids, writing specifications, identifying potential vendors, evaluating systems and services, and preparing RFPs (request for proposals) (pp. 27-28). These RFPs have to ensure that future activities be accommodated by the systems selected for use and that these are also documented (i.e., systems must be sized to meet potential for growth and development as well as strategically developed to support linking capabilities among systems and to allow similar connections to other multimedia resources). Systems costs, Gaddis notes, include central processing units, disk and/or tape storage/drives, printers, freight and installation, and maintenance (p. 28). Costs must be included for terminals for staff and users, wands or laser readers, and furniture for equipment. There are obvious software costs (for the operating system, application programs or modules, maintenance, customizing to accommodate local systems), interfaces to other systems, and backup systems. There is site preparation (space, air conditioning, raised floors, dedicated electrical power, power protection, fire extinguishing systems, grounded electrical outlets, individual surge protectors, antistatic materials, cleaning kits for terminals, and cabling throughout buildings). There are conversion costs (bibliographic with authority control; copy level conversion and barcoding; patron file creation; and creation of patron identification cards). There are implementation costs (time for planning, including staff line reporting, and developing policies and

procedures), installation, training, publicity, and public relations in an environment where there is also operational disruption for barcoding of collections, structural modifications, rewiring, and so on. At the end, there is staff recognition for all of the implementation activity. And always there are ongoing operational costs (including bringing systems up and taking them down), doing file saves; ongoing staffing needs for troubleshooting problems with peripherals and software operations; for coordinating vendor maintenance performance; for preparing documentation of hardware operations as they are handled locally, including emergency procedures; for performing day-end processes, including generation of reports and notices; ceaseless needs for funding initiatives to cover purchase costs for enhancements; membership in user groups (membership fees, travel costs, and staff time to attend meetings); and other developmental service components that grow from a successful library management system.

Peter Spyers-Duran (1990) provides a concise summary of the benefits of automation, as follows:

1. "handle a large volume of routine and repetitive transactions";
2. "facilitate better, sophisticated, more varied information management and retrieval of information";
3. "assist with the general management";
4. "reallocate resources to meet contemporary needs";
5. "offset cost of labor"; and
6. "introduce cost avoidance measures through resource sharing, joint ventures, sharing staff specializations and improved means of communication" (p. 8).

Another, even more important, benefit is discussed by Tyckoson (1989): "[Automation] allows users to access and share information by methods that could not be achieved with more traditional formats" (p. 11). Many libraries have already begun planning and implementing other benefits of the new technologies, including coordinated collection development; speedy document delivery of full-text information; ability to digitize special collections unique to a particular library; linkages and interfaces with other information agencies, vendors, and libraries for data that are not held locally; improved and enhanced access to visual and sound collections; and expanded capabilities to use all the new technologies and, often, even the more traditional formats in an interactive multimedia way in wired classrooms around the world with real face-to-face online collaborative research and study going on among students, faculty, researchers, and scholars. Other benefits include, Rush (1986) notes, "expanded service to the public, decreased backlogs, more timely

processing, increased productivity, reduced space requirements, or other improvements" (p. 115). Joan Frye Williams adds another benefit: "an automated system contains staff costs by accommodating workload increases" (p. 117).

Funding priorities today must also include assisting with standardization of databases, communication and access protocols, and simplified entry from one system or personal computer into other systems, regardless of location, type of system and network, and computer (mainframe, personal computer, or other). Funding priorities must provide for continuing innovation and creativity to enhance access to all information resources—print and nonprint, electronic, and so on.

Juergens (1990) notes that, "there are at most 1,400 library employees in all of the nation's technology-based networks, as opposed to 340,000 library employees in the country in 1987, according to the American Library Association" (p. 20). Of those 340,000 library employees, it would be interesting to discover how many of them use automation daily and at what level. Juergens also states that "bibliographic networks (e.g., OCLC, WLN, RLN) cost 1-2.8% of a library's annual expense budget" (p. 22). Hunter (1988) notes that, "the amount of recorded literature doubles every 15 to 17 years" (p. 37). The amount of that literature in electronic format is still a minimal part of information dealt with by libraries, but it is growing dramatically each day. Hunter (1988) also notes that "we are already technically capable of doing far more than our budgets will ever allow" and that "scholarly publishers and research librarians cannot afford all of the things which new technology makes possible—we will have to make choices" (p. 40). Gupta (1991) states that, "the investment in information systems, if used effectively, will lead to improved information systems performance, and hence will result in better organisational decision making which may enhance the overall performance of the organisation" (p. 105).

Malinconico (1992) quotes David Bishop (*JAL*, Sept. 1989, p. 197) saying that "revenues earned by the electronic database industry are already near \$11 billion and are expected to grow 20% per year for the next 5 years, reaching more than \$22 billion by 1995" (p. 37). Malinconico (1992) also notes that database growth is about 25 percent per year with CD-ROM database growth about 60 percent per year. In addition, he notes the growth of electronic journals, specialized networks—such as NASA's Mission to Planet Earth—campuswide networks, electronic imaging and virtual libraries, and national network development—such as the NREN (National Research Education Network) (p. 38). As he points out, "the new information services simultaneously increase user need for the assistance of

information specialists and reduce the contact they have with them" (p. 40). Susan Baerg Epstein (1990) expands this to note that with the new technologies we have "improved services and limited increases in number of staff needed to meet greater demands" and that "existing staff can [now] be more productive" (p. 114).

A major problem with the new technologies which libraries must learn to deal with more effectively is the fact that new electronic systems represent additional ongoing expenses. James E. Rush (1986) feels that the application of new computer technologies will help us "to improve service, to make more informed decisions, and to lower costs or avoid cost increases" (pp. 114-15). A major improvement in service via speedier document delivery of journal articles via CARL UNCOVER 2, FAXONFinder, and FAXON Xpress—as well as similar services, with full-text delivery over the Internet using excellent text/graphics copy via resources such as RLG's ARIEL—demonstrate a growing phenomena.

Many libraries have found new, or adapted old, methods to increase their fiscal resources. These include, as Rush (1986, p. 115) notes, sharing costs across consortia; distributing operating costs over a broader base; improving resource sharing through state and federal grants and through proposals to foundations; obtaining legislation for funding; gaining funds from wealthy and influential citizens/benefactors; and offering revenue-producing services to businesses. Williams (1986) adds "allocating available operational funds more wisely using management reports generated by automated systems, transferring financial resources now supporting repetitive clerical tasks to other parts of the budget in order to improve direct user services" (p. 117). Williams also suggests that a library should "deposit one seventh of the system's original price in a special interest-bearing replacement account" each year, or consideration of funding strategies such as "commercial lease-purchase agreement, Municipal Leasing Corporation (MLC) Lease Purchase Agreements, and Limited Partnerships with investors" (pp. 117-18). At least one academic library (Southern Methodist University Libraries, Dallas, Texas) received a \$500,000 endowment for library automation and new technologies.

Strategic planning for electronic systems, most library administrators will agree, is an absolute necessity. Mann (1986) suggests "intensive long-range planning and budgeting programs that include start-up, performance, utilization, enhancement, and replacement criteria for each component of the system" (p. 118). He also urges preparation of "financial feasibility studies before the library initiates investments in technology, preparing strategies, and projections to relate investments in technology to financial benefits such as the avoidance and/or recovery of costs as a result of reduced

operating expenses, and use of ratios and other analyses to identify trends in the financial health of the library, and comparison of the results with trends at peer libraries" (p. 118).

Future technologies will continue to change libraries and the ways in which they operate. Bazillion (1992) focuses on the new "notebook computers of increasing power and portability" which he feels will "reduce valuable space [required] for banks of conventional pcs [personal computers]" and which "will not need the same noise reduction" considerations (p. 10). But what will they need in the availability of active telecommunications ports to connect to the local library system? What will that flexibility cost? He also predicts that "CD-ROM will diminish as library computers become more powerful, and software more sophisticated..." (p. 10), and that "libraries will be regional research centers which must provide enough communications ports for convenient dial-in access" (p. 12).

To estimate costs for a system, Bolef (1987, p. 109) and Kirby (1986, p. 15) suggest that one must consider both one-time and ongoing costs. The following is a breakdown of those items and some general estimates of costs based on one mid- to large-size academic library:

One-Time Costs

Retrospective conversion of bibliographic records, including extracting from OCLC files, removal of duplicate records, authority control processing, collection analysis on resulting files	\$725,000
Library management software	\$99,500
One-time conversion software	\$44,150
System software augmentations:	
GTO OCLC record transfer	\$10,000
QUIKMERGE for tapeloaded index efficiencies	\$5,850
Multiple-database access subsystem (10+ databases)	\$125,000 (plus interest if paid over time)
Basic hardware (computer, i.e., mini, micro, or mainframe), CPU (Central processing unit) and its parts including disk drives and controllers, tape/cartridge drives, and telecommunications controllers.	Shared, no charge-back to Libraries
First component of peripherals (such as terminals, printers, scanners, and microcomputers with modems)	\$237,500
Installation of telecommunications lines, including telecommunications electronic components (switches, concentrators, conduit, fiber and copper wiring)	\$520,073

Site preparation and associated facilities modifications (e.g., asbestos abatement, rerouting of electrical and data wiring)	\$416,000
Consultant fees.	Prior to official project; funding unavailable.
Training costs	(see "Ongoing Costs" below).
New furniture	(We have focused on this within other initiatives [e.g., Electronic Reference Center].
Supplies (e.g., smart barcodes)	\$18,000
Security and fire prevention devices	\$61,180
Collection preparation, including barcoding and staff/time to do it...	(est. \$15,000 in volunteer time and ca. 2 months of library staff).
<i>Ongoing Costs</i>	
Maintenance contracts for the hardware:	
(a) Mainframe and computer center	(shared, no charge-back to Libraries)
(b) Library peripherals (computers, terminals, printers, and scanners)	(extended warranties with replacement rather than maintenance currently cheaper).
(c) Communications links. Telecommunication costs, including connections between computers, between terminals and computers, and between terminals and printers	1992/93: \$160,000
Maintenance contracts for software: (1992/93)	
(a) Library Management Software	\$30,418
(b) Conversion Software (Loaders/Quikmerge/etc.)	\$975
(c) Database Transfer Software (e.g., GTO for OCLC records)	\$2,045
(d) Multiple-Database Access System Software	\$25,200
	Additional software funds for updating, upgrading, and purchases of new software...including loaders for commercial databases to add to MDAS component (not yet determined for this campus).
<i>Ongoing database files</i>	
(a) GPO records	\$2,500
(b) Authority Records	\$2,272
(c) Additional datafiles	
(1) Early American Imprints	\$5,800

(2) American Theological Library Association microform analytics	not currently available
(3) Southwest Film and Video Archives	(no additional charge to campus)
Supplies (barcodes: patron & library materials; paper and ribbons for printers)	est. \$2,500
Temperature/humidity controls	(shared, no charge-back to Libraries)
Personnel costs (including benefits)	
Library Automation Director	\$77,220
Computer Center Senior Systems Analyst	\$47,520
All library staff have automation workload, but do not represent new positions for the campus.	
Training consultants for existing/new staff	(est. \$5,000-\$10,000/year initially, with time and travel contract. May include here travel for User Group [national, regional] or related professional associations as continuing education requirement).
Security devices for terminals and printers (we have not chosen to implement to date).	
Lighting for terminal screens (we have not chosen to implement to date).	
Public relations	\$12,500
Staffing requirements (desirable):	
Technical Staff: 1 Senior Systems Analyst/Programmer; 1 Programmer/Analyst; .5 SAS programmer; .2 of networking, systems and operations staff	
Library Staff: 1 Project Manager; 2 pc/networking maintenance; 1 electronic file service librarian; 2 bibliographic instruction equivalent for user and staff training; special project staff for clean-up of database, maintenance of datafiles, and so on. Impact on all staff for testing of upgrades, enhancements, and so on.	

The earlier costs represent typical library management system expenditures—other initiatives and extended automation services may add incrementally. Some typical projects are noted here:

- New hardware and networking demands; extended services (special renewal options, document delivery services to off-campus constituents, and so on) (shared, no charge-back to libraries for those options currently in production [e.g., special faculty renewal].)
- Retrospective conversion of specialized collections such as art history slides, manuscripts, photographs, and so on to machine-readable files (development costs not currently available).
- Implementation of new technologies and/or services such as a microcomputer lab (\$26,000 upgrades), CD-ROM Reference Center

(\$136,010), CD-ROM LAN networking (\$70,000 installation), or similar new additions to library service centers—plus maintenance of staff support for office automation (up to \$30,000 per year) Miscellaneous and unexpected expenses.

Bolez (1987) notes that “costs vary with the size of the system (single-function, bifunction, multifunction, or fully integrated) and the amount of modification required” (p. 109). She notes that “after 5-7 years there is a need to upgrade, modify, enlarge, or completely re-vamp” (p. 109). And each year today’s academic libraries are finding that the changes in existing technology are so rapid that it is almost impossible to get by only with initially purchased equipment and software—change is required on an annual, biannual, or more frequent basis.

Camp et al. (1987, p. 348) offer an interesting table on how academic libraries use the regular library budget for automation.

TABLE

	Acquisition (n=41)	Serials Control (n=26)	OPAC (n=25)	Circulation (n=40)
Regular library budget	56.1%	73.1%	24.0%	22.5%
Special allocation from parent institution	12.5%	7.7%	44.0%	42.5%
Outside grant	4.9%	--	16.0%	5.0%
Computer center budget	9.8%	15.4%	--	2.5%
Combination of above	14.9%	3.8%	16.0%	22.5%
Other	2.4%	--	--	5.0%

CONCLUSION

Ongoing tensions will be experienced in library budgets for resources: print, media, microform, and electronic. Library users will expect and demand instant access to full-text as well as indexes and online library catalogs. Internet access will be, and often is, considered the norm. As individual librarians and campuses commit to these projects, the details of budget requirements noted earlier and the goals of service noted must be considered and carefully monitored.

REFERENCES

- Annual survey of automated library system vendors: Integrated, multi-user, multi-function systems. (1992). *Library Systems Newsletter*, 12(3/4), 17-33.
- Annual survey of automated PC-based library system vendors. (1992). *Library Systems Newsletter*, 12(5), 35-43.
- Bailey, C. W., Jr. (1989). Public-access computer systems: The next generation of library automation systems. *Information Technology and Libraries*, 8(2), 178-185.

- Bazillion, R. J. (1992). Personal computing and academic library design in the 1990s: Library design of the future must keep portability in mind. *Computers in Libraries*, 12(3), 10-12.
- Berry, J. (1989). Upgrading systems, software, & microcomputers. *Library Journal*, 114(15), 56-59.
- Boissonnas, C. M. (1986). What cost, automation? *Library Acquisitions: Practice & Theory*, 10(2), 107-112.
- Bolez, D. (1987). Cost considerations in automating the library. *Bulletin of the Medical Library Association*, 75(2), 109-113.
- Bridge, F. R. (1992). Automated system marketplace 1992: Redefining the market itself. *Library Journal*, 117(6), 58-72.
- Broering, N. C. (1984). An affordable microcomputer library information system developed by Georgetown University. *Microcomputers for Information Management*, 1(4), 269-283.
- Buckland, M. K. (1988). Library materials: Paper, microform, database. *College & Research Libraries*, 49(2), 117-122.
- Burlingame, D. F. (1989). The small library and fund-raising for automation. *Library Hi Tech*, 7(2), 49-52.
- Camp, J. A.; Agnew, G.; Landram, C.; Richards, J.; & Shelton, J. M. (1987). Survey of online systems in U.S. academic libraries. *College & Research Libraries*, 48(4), 339-350.
- Cullen, R. (1992). A bottom-up approach from down-under: Management information in your automated library system. *Journal of Academic Librarianship*, 18(3), 152-157.
- Dowd, S.; Whaley, J. H., Jr.; & Pankake, M. (1986). Reactions to "Funding online services from the materials budget." *College & Research Libraries*, 47(3), 230-237.
- Drabenstott, J. (Ed.). (1985). Projecting library automation costs. *Library Hi Tech*, 3(3), 111-119.
- Drabenstott, J. (Ed.). (1986). Funding library automation. *Library Hi Tech*, 4(1), 111-119.
- Epstein, S. B. (1990). Selling automation to your patrons: It's easier than you feared. *Library Journal*, 115(17), 63-64.
- Gaddis, D. (1989). Automation of the public library: Cost implications for the library budget. *North Carolina Libraries*, 47(1), 26-32.
- Gaida, H. H. (1986). The real cost of the online catalog: Report on a panel discussion, TLA College and University Libraries Section, Fall Conference, November 1, 1985, University of the South, Sewanee, Tennessee. *Tennessee Librarian*, 38(1), 24-25.
- Geraci, D., & Langschied, L. (1992). Mainstreaming data: Challenges to libraries. *Information Technology and Libraries*, 11(1), 10-18.
- Grycz, C. J. (Ed.). (1992). A special issue on economic models for networked information (Issue theme). *Serials Review*, 18(1-2).
- Gupta, Y. P., & Chin, D. C. W. (1991). An empirical examination of information systems expenditure: A stage hypothesis using the information processing and organizational life cycle approaches. *Journal of Information Science*, 17(2), 105-117.
- Hartinger, V. J. (1990). Justifying non-traditional automation projects. *Library Software Review*, 9(4), 228-230.
- Havercamp, D. (1985). Integrated library systems for small libraries: Estimating the cost. *Library Hi Tech*, 3(4), 61-65.
- Hilton-Chalfen, D. (1991). Planning for campus information technology access: What must we do? *EDUCOM Review*, 26(1), 51.
- Hughes, C. A. (1992). A comparison of perceptions of campus priorities: The "logical" library in an organized anarchy. *Journal of Academic Librarianship*, 18(3), 140-145.
- Hunter, K. (1988). Academic librarians and publishers: Customers versus producers or partners in the planning of electronic publishing? *Journal of Library Administration*, 9(4), 35-47.
- Illinois State Library Automation Committee. (1989). Plan for funding automated resource sharing in Illinois libraries. *Illinois Libraries*, 71(3/4), 218-236.

- Juergens, B. (1990). Costs and new technologies: The view from the network/broker. *Technical Services Quarterly*, 8(1), 17-28.
- Kirby, C. L. (1986). Automation funding for libraries. *Information Reports and Bibliographies*, 15(3), 15-16.
- Lawrence, G. S. with Matthews, J. R., & Miller, C. E. (1983). *Costs and features of online catalogs: The state of the art*. A report prepared for the Council on Library Resources. Research report RR-83-1. University of California, Office of the Assistant Vice President, Library Plans and Policies.
- Lawrence, G. S., & Oja, A. R. (1979). *An economic criterion for housing and disposing of library materials, based on frequency of circulation*. Research report RR-79-2. Berkeley, CA: University of California, Office of the Assistant Vice President, Library Plans and Policies, Library Studies and Research Division.
- Le Compagnon, B., & Leydon, J. F. (1991). Manage computer support costs through effective user training. *CAUSE/EFFECT*, 14(2), 47-53.
- Malinconico, S. M. (1992). Information's brave new world. *Library Journal*, 117(8), 36-40.
- Mann, T., Jr. (1986). Funding for library automation: A forum. *Library Hi Tech*, 13(Spring), 118-119.
- Michalko, J. (1990). Costly boundaries: Costs, new technologies, and bibliographic utilities. *Technical Services Quarterly*, 8(1), 29-36.
- Montgomery, J. R., & Snyder, J. K. (1989). Costing a library: A generic approach. *Research in Higher Education*, 30(1), 47-87.
- Morris, D. E. (1989). Electronic information and technology: Impact and potential for academic libraries. *College & Research Libraries*, 50(1), 56-64.
- Nelson, N. M. (Ed.). (1991). *Library technology 1970-1990: Shaping the library of the future: Research contributions from the 1990 Computers in Libraries Conference* (In Supplements to Computers in Libraries, No. 25.). Westport, CT: Meckler.
- New question for the 80s: What price automation? (1985). *Library Journal*, 110(6), 20.
- Nielsen, B. (1989). Allocating costs, thinking about values: The fee-or-free debate revisited. *Journal of Academic Librarianship*, 15(4), 211-217.
- Niemeier, K. (1990). Funding technology for secondary school libraries. *Computers in Libraries*, 10(11), 50.
- Ogg, H. C. (1991). CheapLANs: Resource sharing on a budget. *Library Software Review*, 10(3), 179-185.
- Pasqualini, B. F. (Ed.). (1987). *Dollars and sense: Implications of the new online technology for managing the library* (Proceedings of a conference program held in New York City, June 29, 1986. Machine-Assisted Reference Service Section, Reference and Adult Services Division, American Library Association). Chicago, IL: American Library Association.
- Poole, J. M., & St. Clair, G. (1986). Funding online services from the materials budget. *College & Research Libraries*, 47(3), 225-229.
- Potter, W. G. (1989). Expanding the online catalog. *Information Technology and Libraries*, 8(2), 99-104.
- Reader, E. A. (1989). Competitive procurement of integrated library systems. *Library Hi Tech*, 7(2), 7-15.
- Riggs, D. E. (1989). Capital outlay—Buildings and computers: Plans, budgets, and project management. *Library Administration Management*, 3(2), 87-92.
- Rogers, M. (1992). Conference reveals melee in multimedia world. *Library Journal*, 117(7), 22, 24-25.
- Roose, T. (1987). Persuading your board, promoting your service. *Library Journal*, 112(7), 60-61.
- Roose, T. (1988). Why ask the board? *Library Journal*, 113(2), 46-47.
- Rush, James E. (1986). Funding library automation: A forum. *Library Hi Tech*, 13(Spring), 114-117.
- Schuman, P. G. (1990). Reclaiming our technological future. *Library Journal*, 115(4), 34-38.

- Spyers-Duran, P. (1990). Cost of library technologies: the bottomless pit of the 1990s? *Technical Services Quarterly*, 8(1), 3-16.
- Sitts, M. K. (Ed.). (1985). *The automation inventory of research libraries 1985*. Washington, DC: Association of Research Libraries, Office of Management Studies.
- Taylor, R. G., Jr. (1987). Incremental costs of library service policies for online catalog access. *Information Technology and Libraries*, 6(4), 305-309.
- Tenopir, C. (1991). Predicting the future. *Library Journal*, 116(16), 70, 72.
- Tenopir, C. (1992). File reloads. *Library Journal*, 117(8), 57-58.
- Tyckoson, D. (1989). Electronic databases, information pricing, and the role of the library as a collective information utility. *Technicalities*, 9(6), 11-13.
- Weiskel, T. (1989). The electronic library and the challenge of information planning. *Academe*, 75(4), 8-12.
- Williams, J. F. (1986). Funding library automation: A forum. *Library Hi Tech*, 13(Spring), 117-118.