



---

# Redefining Library Space: Managing the Coexistence of Books, Computers, and Readers

by Mary Augusta Thomas

---

**Library design must better integrate space for collections and computers than it has. This article presents planning strategies that integrate digital products and print collections based on patron needs. Many flexible solutions in developing buildings will enhance library service in the technologically dynamic future.**

**A**lmost any librarian, when arguing the need to expand space for collections and public service, confronts the claim that the paperless society will eliminate book stacks and make reference desks obsolete. This vision of the future, a fashionable idea since the late 1970s, held that the coming of computers would result in a paperless age. Journals would appear in electronic versions making print products obsolete. The mandate to develop and maintain large collections would vanish as both new materials and retrospectively converted materials became available in electronic format. Reference books would be relics, as users and staff would do online searches and find their information needs completely met. In addition, libraries would transfer many older collections to microforms and digital formats.

In the past few years, with digital projects gaining prominence, vendors and librarians impressed administrators with their acceptance of the “information superhighway,” a vast electronic resource through which fully digitized collections would be available. If, as one demonstration asserted, the Library of Congress’s holdings would fit on a credit card, physical space for stacks and reading rooms could be greatly reduced. Librarians could provide library services from a computer closet, allowing access to the same information formerly given in a several thousand square-foot facility. Even library space planners began to reduce projections for print collections’ growth in developing building programs.

In an information on demand environment, no library will succeed without incorporating technology into daily operations. Most libraries, however, will continue to collect and maintain hard-copy editions. Right now, our definition of a library as a place continues to require

that printed texts be preserved along with their online versions. In addition, libraries, academic and public, continue to serve as community gathering spaces. Good planning and design require bringing both traditional collections and functions into harmony with new technology and new services. Before curtailing or radically reducing space for housing library collections and staff, reviewing both the actual pace of change and the emerging patterns of library usage is crucial. Only design solutions that are flexible, and forward looking, while retaining the best of the past, can provide an environment in which librarians offer superior assistance to their patrons.

## THE PAPERLESS LIBRARY

The paperless library does not exist. Between 1991 and 1995, The University Licensing Program (TULIP) whose participants included Elsevier Science and nine major universities, tested networked delivery and the use of journals at the desktop. In a report prepared at the study’s conclusion, the project’s coordinators stated that “A common view, which all TULIP participants share is, that the transition to a digital library will go slower than they had expected before starting the project.”<sup>1</sup>

Most books and journals are still printed on paper even after several decades of electronic publishing. The reasons for the continuing existence of print sources warrant a brief summary. Suppliers and consumers of electronic information share many similar issues regarding costs, legal issues, property rights, and reproduction quality. On the suppliers side, both the economics of publishing and publishers’ concerns for copyright and intellectual property protection have affected the speed with which publishers issue books and journals in electronic for-

*Mary Augusta Thomas is Assistant Director for Management and Technical Services, Smithsonian Institution Libraries, NHB 22, Washington, DC 20560-0154 <Thomasm@sil.si.edu>.*

mats. While they offer online versions of their most popular serials or those that depend on timeliness, most publishers do not republish back numbers for many titles. Most electronic journals are in highly specialized fields, and frequently require an accompanying subscription to the paper copy. Digitizing projects are expensive at the inception but once produced, may be infinitely repeatable for multiple users. The durability, methods of preservation archiving, and the retrieval and maintenance of digital versions are yet unresolved issues. Legal issues of rights and responsibilities for intellectual property are only slowly being addressed and publishers, along with their authors, are worried about controlling the authentic version of published works.

For the consumer, ease of use continues to define the medium of choice. Monographs, for the most part, do not have an online equivalent. A book's portability and relative ease of access assures its continuing popularity for reading while the powers of electronic resources lend themselves to more targeted research. Electronic information is always available. Multiple readers may consult the identical item at precisely the same minute. Conversely, most libraries make the printed materials in their collections accessible to multiple researchers only if the library is open and the book remains on the shelf.

Continuing dependence on paper-based collections may be a response to the availability or lack of highly sophisticated computers. No matter how advanced an online text may be, as a CD-ROM, a World Wide Web version, or a directly accessible data file, that text is only as useful as the technology available to receive it allows. Without good equipment, users may not get an exact copy at each terminal. How many libraries can provide state-of-the-art computers for all their readers?

Electronic resources meet the basic needs of many inquirers and serve patrons who search the library from remote locations. Students prefer using online terminals for ready reference, for some browsing, and for very directed querying. For most adult readers, the book remains the medium of choice for extended reading. Millions of individual journal articles and most monographs are not available online, either in full text, or through indexing services. Though more texts become accessible on the Internet each year, advanced research in many disciplines re-

quires that investigators evaluate extensive print collections besides the full range of electronic information.

Because books will continue to be produced and computers will become even more effective tools for research, future library design must provide seamless access to the information provided in both print and electronic formats. Librarians have written much about the shift from emphasis on ownership particularly in academic libraries to the idea of access. Providing access to information in all formats at any location from any location is the challenge for the 21<sup>st</sup> century library. To meet that challenge, library design must provide a better integration of space for collections and computers than has happened in much of the retrofitting done to date. It is possible that academic libraries of the future will achieve a coexistence of the paper product and their digital counterparts that change the look of libraries. It may not.

The values and services supported by libraries for centuries will continue. These include ownership of some collections, access to others, the organization of resources, and assistance to users, including responses to specific information needs and questions, information guidance, and formal instruction. These services call for the capabilities of an array of professionals, specialists, and other staff in a library which have a physical location or exist "without walls."<sup>2</sup>

The models outlined in this article suggest two alternatives for planning libraries that integrate digital products and print collections based on patron needs. Both strategies include suggestions for developing programs that enhance library service in the future.

### AN OVERVIEW OF LIBRARY SPACE PLANNING

Before looking ahead, looking back at traditional library space planning and how it incorporated earlier technology is constructive. For centuries, library staff worked with paper collections, relying on hand written documents for cataloging and other procedures. Design for libraries began with the placement of book stacks, based on standards that recognized that library collections have weight, shape, and growth. Stacks are difficult to configure except in square or rectilinear spaces. Traditionally, readers carried materials away from the stacks to read at tables and carrels or charged them out for use elsewhere. Library space planning manuals

published even in the past 20 years, stressed the need to set space allocations that started with the required volume of books or paper-based collections, either bound or unbound. Reference desks and reading rooms occupied distinct areas removed from the collections and materials were processed in offices, often on the margins of the stack.

In the 1900s telephones and typewriters were introduced into library work and were, in turn, supplanted starting in the late-1970s, with computer terminals for processing. In the 1980s, the coming of the online public access catalog (OPAC), introduced the computer terminal into the public space of most libraries. Because most librarians placed their first dedicated OPAC terminals near the existing card catalog, they did not pay attention to changing the overall design of the space. The hasty insertion of computers into catalog areas, recognized that readers wanted to use not only the local online catalog but also online catalogs of other libraries anywhere in the world. As the demand for using terminals grew, more machines were added wherever they could be placed, powered by hurriedly installed power poles, cables laid on the floor and strung along the walls. Librarians sacrificed the esthetics of library spaces as staff turned previously un-wired areas into computer rooms. Many retrofitted libraries from that period obscured formerly handsome buildings in a web of cables and surface mounted conduits, replacing visually pleasing rows of bound books on wooden shelves with computers and printers. Finally, librarians removed the card catalog in most libraries, only the terminals remained.

In 1988, Richard Boss, library consultant and planner, noted that "It appears quite likely that for at least the next twenty years libraries will have to be designed with room for books, journals and readers at tables. But, they will also have to accommodate computer rooms, computer terminals and a number of other electronic devices."<sup>3</sup> However, library interior renovations and redesigns from this period were carried out quickly to meet the demand for online access and failed to integrate existing print collections with the powerful workstations introduced into both the reading room and the stacks.

Well into the 1990s, the haphazard placement of computer terminals into library space not designed for technology revealed an uneasy coexistence between digital and printed collections. Many

“wired” libraries, did not adapt to both online resources and print products, choosing to replace one with the other, and failing to give felicitous, effective access to either resource. The renovated San Francisco Public Library maintained large print collections but introduced enhanced electronic services. The library staff now staggers under the weight of high circulation demand and the increased need for more online access. When the library discarded outdated printed books to make room for greater electronic access San Francisco residents, began a revolt of sorts with armies arrayed on both sides of the divide. San Francisco and other systems, public and academic must balance the overwhelming popularity of online resources with the continuing need for paper collections.

### LIBRARY BUILDING PROGRAMS

The development of a well thought out and very specific building program is the most crucial stage in the design of any new library space or renovation. Through a carefully constructed program, library managers and staff address the major issues that serve to define how to integrate digital and traditional library services.

For most readers, the word library still connotes a physical space, though recent theories pose the possibility of the virtual library being “a place” too—only in cyberspace. Most managers still plan for three-dimensional spaces. The newest building projects suggest that the type of environment needed for future libraries may be different in response to how readers use digital information. It is a question of the quality and not the quantity of space. The major challenge for library managers who plan for new or renovated library space is how to incorporate as much flexibility as possible in their designs to provide for a variety of reader spaces and interactions.

---

**“The major challenge for library managers who plan for new or renovated library space is how to incorporate as much flexibility as possible in their designs to provide for a variety of reader spaces and interactions.”**

---

Three major questions might guide the library space planners’ design choices. What is the reader’s preferred format; printed information, online information, or a combination of both? What services must the library provide to the reader? How will services be delivered? Does the physical space support the reader in a pleasing and appropriate environment that allows him or her to use multiple formats easily?

Space solutions, which design areas for a single purpose, defined by a discrete function, are disappearing because readers themselves blur former distinctions. If a student brings a laptop computer to the library and uses it to search the catalog then the catalog itself moves with the reader, into any area of the library. If the same student sends electronic mail to a professor then their interaction, like an actual office appointment takes place in the same stacks. If the library opens a computer learning center for both teaching and open searching, the library itself becomes the classroom. What works best in each space determines the design. If reference service is best accomplished face to face, then the reference area becomes the center of the design and all other subsidiary functions move to the edges. Are the collections the reason that a user comes to a particular library? Access to them both physically and intellectually becomes paramount. Aaron and Elaine Cohen describe a planning method using the “central square”<sup>4</sup> for focusing on the most important transactions that occur in a space. The fluidity of some libraries’ functions means that any of the interactions above may, at a given time, require being in the central position. Only when the hard process of evaluation, the “triage” of functions critical to what really happens in the library, takes place, is design for true integration possible.

Traditionally, the library building program addressed the discrete functions of a new structure as collections, services, reader spaces and library offices within the walls of a building. Yet, the challenge in this current period is to use the building program to define what actually happens within the libraries’ walls and what takes place beyond them. To paraphrase Willie Sutton, people go to libraries because that is where the books and periodicals are. Nevertheless, increasingly it is the place where the computers are and, in turn, the place where users go to connect to the Internet. In 1997 alone, the number of people who got to the Internet from an

alternative space (which included libraries) tripled from the previous year.<sup>5</sup> The library program of the future needs to incorporate this community function.

Most library buildings contain all library operations. However, in the future, space will likely be allocated by determining the core functions that must be available to readers. Library planners may look for other options for housing technical services. If processing is conducted electronically, then it might happen at a remote site. If an excellent computer network exists, perhaps library planners could develop a separate facility. As an alternative, providing good high-speed transmission would allow staff to work from home computers reducing library space allocated for the final preparation of materials.

Finally, the library program must incorporate the means of measuring the effectiveness of the library design and evaluating the impacts of decisions made in the programming phase. This final process, developing means to assess the building, often raises new and important questions, which can then be integrated into the design process.

### THE REAL AND THE VIRTUAL LIBRARY

---

**“The traditional library as a physical place retains value and social identity in its community, whether for a town or an institution.”**

---

The traditional library as a physical place retains value and social identity in its community, whether for a town or an institution. What must the library be for its community in the digital age? For some future users, the library will not be somewhere they go physically for service but a place they reach from a remote location. For others, human interaction and direct communication will be important. Where and how does service take place? Are computer users helped directly by staff in the area, left unassisted, or assisted through digital products despite whether they are in the building or somewhere else? Do library buildings and services have limited hours or are they open around the clock, physically or through the World Wide Web? Are librarians re-

quired to protect print collections? If not, can some collections be considered disposable so that buildings may be open at all hours? Should staff offer services in a central location or directly to departments, homes, or communities? If services are decentralized, what do they look like? Do the remote service points have both books and workstations?

Most library planning still needs to consider print collections. Besides calculation for the current collections, for example, the planner now faces greater difficulty in predicting growth rates. In the past, calculations were based on the libraries buying patterns in each discipline over time. Each volume was a measurable object and methods of calculating the number of shelves required are easy to find. However, for the past two decades at least, all librarians have acquired different media. First, libraries added microforms that required substantial floor space although not the gross square footage of books. Then multimedia collections gained greater importance bringing film and video and the machinery for their use into the library. Most recently, they have expanded library acquisitions' budgets to include electronic information. Substituting digitally produced information for some hardcopy leads to a quandary in how to develop and refine formulas for the rate of collections' growth. Looking at the actual buying pattern of the past two years is perhaps the only guide. Is the library buying or leasing digital copies of things, instead of hardcopy? If yes, then depending on the percentages, all the standard formulas will need to be revised. If not, then most of the already tested formulas still may be used.

In addition, library planners must decide how many workstations they need and how to configure them. Some very good recent works done for the Library Administration and Management Association, the Special Libraries Association, and others give formulas for space allocation and other space considerations.<sup>6</sup> A few categories for planning are outlined below.

In developing design strategies for the coexistence of digital and traditional libraries, consider some following possibilities to incorporate maximum flexibility in reading areas and stacks.

- Install compact movable stacks that might be moved to remote areas of the building if the printed collections become less critical to researchers. If the

library cannot afford to install a compact system immediately, the architect should construct the floors in a way to allow for that in the future.

- Wire new buildings and renovated spaces beyond what is currently required. Think ahead to at least the next renovation. Provide alternatives for bringing both power and data to tables through flat wire and wall mounted cable channels. Design grids of wiring in the floor. Use universal cable to carry voice, data and local area network (LAN) access. "Three of the most important elements to consider when planning a library space are lighting, power and energy."<sup>7</sup>
- Purchase furniture made in shapes that combine in different formations. Use furniture that contains electrical wire.
- Plan overhead lighting to make it possible to put computer work stations in any area of the library.
- Incorporate workstations into ready reference stack areas to give the sense that books and terminals are both means of finding information.
- Re-engineer the heating and ventilating systems in areas with terminals to allow for the heat they produce.
- Design for reducing the glare on the screens. Consider the locations of the windows and the directions each face to track how much light enters at all hours.

## TWO MODELS FOR DESIGN

### Electronic Access/Low Reliance on Collections

Once library planners have carefully defined the audience for a particular library's service, two basic models that respond to points raised above, emerge. The first model employs technology as its primary material for learning while the second model combines large collections and information technology in support of advanced research. For either model to be successful, the needs of the particular users must be carefully and thoroughly defined.

In the high electronic access scenario, printed collections are in a complementary or even secondary role. Having made the initial change to encouraging electronic access, the library will continue to evolve in a planning period of 20 years. Even in an academic setting, the model serves the more general body, both as a

learning space and as social area for interaction. The type of popular material purchased for an undergraduate library, learning center, or resource center continues to be current and portable. Materials typically are very broad in nature. Groups of students may work together for research and collaboration.

---

**"Given the rate of change in the design of computers and the production of electronic information, any library that incorporates technology into its reference space will need to plan for almost annual expansion."**

---

Reference service in this type of library has already changed based on the integration of electronic tools. Given the rate of change in the design of computers and the production of electronic information, any library that incorporates technology into its reference space will need to plan for almost annual expansion. Today many patrons come to the library solely to use electronic information. Therefore, designers should place terminals prominently, making them both easily used by readers and visible by the staff. Allowing for staff assistance while providing privacy, for searchers is a design challenge. Library planners need to consider how to make space devoted to computer terminals the "central square" if they can define those terminals as the most heavily used service point. Formerly, workstations were near indices and catalogs; planned for quick reference checks. In fact, readers may use online texts like books and they should be as prominent as the collections and promote long term access. Depending on how many terminals a library can make available to the public, designers might mix heights and environments. A mix helps in meeting the Americans with Disabilities Act (ADA) requirements and takes into account users' behavior. The stand-up terminal encourages quick queries whereas an option of sitting to search the OPAC facilitates use of the computer by the less skilled.

The "intelligent building" one that has computer wiring throughout, could allow readers to bring in their own laptop computers providing power sources and add-

ing data ports to one or more tables in each reading area. In many designs, computer use has been limited to separate rooms. Although that solution may contain the noise associated with workstations, it isolates users.

If, as may be likely, the coexistence of printed information and electronic access continues indefinitely, the library manager must take into consideration the amount of training that most readers require to use computers efficiently. Incorporating maximum flexibility in designing training areas will allow the use of space for special-purpose classes like searching the Web for particular sources or using sophisticated discipline specific applications. "Training" terminals require a different space configuration than ones used for an OPAC or other dedicated product. In many libraries, online reference and indices in CD-ROM format, tutorials, Web browsers, and video programs are heavily used and have distinct design considerations—including the need for appropriate lighting and sound buffering.

In addition, the library may need a formal training area for offering classes in electronic media use and in research for a particular field or discipline. That area need not be in the most public space. The New York Public Library, Science and Business Library integrates workstations into reading spaces throughout the building and also incorporates separate computer classrooms adjacent to the public area.

Clearly, the design challenge is to plan for the greatest number of terminals that staff can maintain, arranged in a pleasant, interesting setting, conducive to study. Although collections may move to a lesser-used area, they need to remain accessible. Many readers still search printed sources, along with online resources.

Does the library have printed tracers and quick hit bibliographies? An information kiosk in the reference area presents both paper and online equivalents like the library home page. Having both together allows readers to choose their preferred method of access. Electronic resources vary in content. Home pages may contain a large volume of information. The Smithsonian Institution, for example, placed enough information on its initial home pages that it required 35 hours to read it all. Does anyone sit for 35 hours, nonstop, to read? Many people print items and read them later, others download and manipulate text, or quickly check for the

most recent data on a topic. Readers consult electronic news sources and services daily and sometimes more frequently.

Architects need to incorporate state-of-the-art wiring for high-speed transmission, clear demarcations of networked and open access terminals, and the ability for group and private study into the design. Some of the following points would guide the final planning. As many desks will be in one area, dividers could be placed between terminals and if possible between sections of workstations to control the noise and confusion. Dividers also give a certain amount of privacy. Plans that include adjustable desks at varying heights will increase the reader's comfort. Managers could give readers access to the library resource center for a greater number of hours if the collections are seen as disposable. If security of collections is not as important as service to readers, the library could have many doors and connections with campus thereby promoting more use. For the same reasons, a ban on food and drink might not be required. Finally, ADA design considerations may affect space planning for an electronic resource center.

#### **Electronic Access/High Collections Reliance**

The second model addresses the situation of most academic/research libraries that must retain strong collections while incorporating high densities of computers. The challenge for library managers increases phenomenally and the need for flexible planning is imperative. Collections maintained by large academic research libraries are expensive to purchase, to make accessible and to house. For the present, the possibility of replacing costly serials with electronic surrogates is small. Not only will academic research libraries need to maintain collections of primary and secondary materials, they will need to continue to collect in those fields and increase the preservation component of their activities. Cooperative collections' development of hardcopy works has not been as successful in relieving the burden on housing collections as predicted. Sharing purchasing for electronic resources has been more successful but not necessarily less expensive, because purchasing and maintaining computers is an additional burden on the library budget. Philip D. Leighton and David C. Weber outlined the path academic libraries followed in setting up automation during the 1960s and 1970s. "Buildings as a whole were

not adjusted to computer technology, but rather, the technology was accommodated by retrofitting individual spaces and systems for the computer."<sup>8</sup> Although building design in the 1980s began to incorporate terminals in more areas of the library, it was not until the mid 1990s with projects like the University of California, Irvine's Science and Technology Library in 1994, that the incorporation of technology into library space became the driving force in major library projects. The sheer bulk of books—millions of them—defined planning for library space. Today, most academic libraries house collections and incorporate electronic functions into the same space.

The academic research library manager needs to provide library space that allows for collection growth while incorporating user-friendly terminals that supplement browsing through the stack. Recent articles have addressed browsing the virtual library in contrast to browsing the stacks of the traditional library. Online searching may not equal the quality of serendipity in successful browsing. Librarians often place online resources, CD-ROM, for example, next to printed indices in the reference area for convenience. Placing tools like electronic indices next to the collections might better meet researchers' needs.

In today's academic libraries, students require workstations for many different types of access. Not only is the electronic version of the library catalog in demand but also students spend considerable time on searching the Internet, working with large data programs, using word processing packages, and reading their e-mail. They want to do all these tasks from the same terminals that they use for reading CD-ROMs and for working with end-user search tools. The University of Washington's U-WIRED project in 1997, added 250 terminals for open access to the second floor of the main library. Other recent examples of similar renovations include the Leavey Library at the University of Southern California in 1996 and in that same year, the Indiana University/Purdue University at Indianapolis library.

---

**"As the demand for scholarly resources increases so does the challenge for truly integrating print and electronic formats."**

---

As the demand for scholarly resources increases so does the challenge for truly integrating print and electronic formats. Graduate students and research faculties do some of their research on the Web. They use complex applications and large databases as well. However, the source materials, which they consult have not yet been converted into digital formats. It is, in fact, unlikely given the cost and labor intensiveness of digital conversion that these large research collections will ever be completely digitized. Nevertheless, while researchers search the book collections, they may also be searching electronic information and need to use a personal computer in proximity. They may use computers for note taking and for contacting collaborators.

The reference desk may be the only feature of a college or university library that seems to remain the same. However, the function of reference is evolving along with changes in the curriculum at many institutions. New learning styles including team learning approaches require librarians to come out from behind the reference desk. Librarians, who have always guided students in information access through bibliographic instruction, are natural members of instructional teams. Working with students both at the workstation and in electronic classrooms, library staff need to be responsive to users anywhere in their area. Librarians continue to need places to sit with students/faculty members to discuss search strategy and resources. The design challenge is to provide easy access to on line information and instruction, while controlling the noise and sociability of the collegial environment.

Reference areas reflect the change in reference tools. For instance, the number of CD-ROM indexes is increasing. Placing the jukeboxes to run CD-ROM applications is yet another design problem. Although, intended primarily for end user searching, electronic resources need introduction and careful monitoring until staff are confident that the users are comfortable with the tools. Instead of needing less reference assistance, most users at least in the early stages of working with new technology or information, need more help. Therefore, library space planners increasingly face the challenge of creating rooms that allow interaction and, concurrently, quiet study.

The mental image of traditional reading rooms is serene, grand, open space. Into this formerly quiet preserve, librari-

ans have introduced a very social function with the coming of technology. Philip D. Leighton and David C. Weber reported, in the 1980s, that library planners believed students would work on computers in their dorms or in campus provided computer centers. The library would only need to incorporate the facilities to supplement a student's capacity to print articles and to hold reserves. Yet by the late 1990s, the pattern of ten years earlier had not taken hold. Libraries remain a gathering place. Even on fully networked campuses with a "port for every pillow," students prefer to study among other students in the relative peace of the library. Readers need quiet study space and a work-like atmosphere. Reading rooms continue to serve both those seeking a respite from student housing and those needing to do advanced research. The development of computer rooms elsewhere on campus lessens some demand on the library, but if a person's research requires simultaneous use of an electronic format and printed matter that need is met only in the library.

There are no easy solutions. The clacking of keys may become background noise to daily life, but it still is considered intrusive by many. People interact differently when working at a terminal. As Leighton and Weber state:

People interact more when using computers than when using most earlier technologies dealing with information. This socializing is due to a number of factors, including the reaction when the wrong key is hit, the waiting for something to happen (fine time to say hello to your neighbor), the general confusion and lack of certainty (and thus the desire to ask "what now?") as new computer users learn the systems, and so on.<sup>9</sup>

Housing computers in an area remote from reading tables and chairs mitigates disruption, but it precludes developing the seamless nature of finding information despite format.

As an alternative, some library planners now intersperse terminals in smaller reading areas, throughout the building. Librarians could cluster collections differently too, by combining stacks, adjacent student reading tables and workstations by subject, perhaps. While creating smaller mixed-use spaces in larger libraries presents design challenges, the resulting increase in flexibility argues for it. Throughout mixed-use areas, using white noise machines, carpeting, and other sound deadening devices will reduce background noise.

Library managers may exercise two seemingly contradictory options to make room for new technology while providing better housing for collections. One option centralizes collections and the other, moves less-used collections to remote storage. Discipline specific libraries, formerly housed in departments, have recently been consolidated as at the University of California (UC), Irvine. In 1994, UC Irvine incorporated several different science libraries in one new facility combining state-of-the-art electronic access with collection storage. Although it may not be feasible on all campuses, closing smaller libraries and consolidating collections into a central facility allows for a more logical arrangement of lesser used materials. Installing compact shelving can save significant floor space. Provided service is maintained, reducing the number of locations that require staff and technology is economically sound.

On other campuses, librarians move collections from the main campus to remote storage facilities. Remote storage is an alternative to overcrowded library buildings particularly when further library additions or renovations are impossible. Remote storage can provide excellent collections housing in a temperature/humidity-controlled environment to preserve and protect material, while making it available for research.

Careful planning for either consolidation or remote storage weighs what to move and what to leave behind. If smaller collections or collection surrogates can meet most direct needs of the department or campus researchers, then moving less-used material will not diminish service. Nevertheless, many librarians have learned, to their chagrin, that collections moved to storage were more valuable than they originally decided. Every library has less-used material that it does not catalog or reflect in the OPAC. However, researchers discover such content when staff catalog collections as part of the transfer to remote storage. At that point demand for those subjects may increase, and the collections on some campuses have returned to the main library.

Whenever librarians remove collections from researchers, technology allows the library to leave something behind. Perhaps one of the most felicitous uses of electronic information is to provide online surrogates. Electronic access, either bibliographic or full text, gives the research community strong links to the information resources removed from campus. Li-

brarians also may provide easy access to collections beyond the libraries' own holdings through electronic means. The remaining "local library" may not occupy significant floor space but should contain important works to the discipline either in print or even exclusively online. Library managers must plan the look and feel of the local service as though it was part of the physical library.

Through local information centers and access to the Web and other online resources, librarians provide almost unlimited means to meet research needs. If books cannot remain near the users who rely on them, the library has a serious responsibility to design good alternatives. "Technology surrogates" for larger collections will suffice only if they are carefully designed to fill real needs. That requires a careful assessment of how printed materials are used in each discipline. If a collection serves primarily as a source of quick references and facts, then a small space with networked workstations, each having a menu of end user search services, and ready reference printed materials might be sufficient. If researchers rely on illustrations, charts, and graphs, the library needs workstations with high-resolution monitors and good printers, which produce reproductions by downloadable software. Full-text databases and electronic journals may serve some scholarly needs as effectively as a large print collection.

Library planners meet one final community need by developing communal space. The library provides room for exhibitions, for performances and for meetings and social exchange. In the past two or three years, academic libraries, such as the Milton Eisenhower Library at Johns Hopkins University, have developed coffee bars and welcoming lobby areas in response to student requests. Popular spaces then draw more students to the library.

### DESIGNING SPACE FOR SUPPORT SERVICES

Designing collection spaces and supplying equipment addresses the public aspect of integrating the traditional and digital libraries. Yet, most academic research libraries face an equally daunting design challenge in developing access services and technical service areas. Technical services departments adopted library automation early, through retrofitting their existing work areas. Cataloging and

acquisitions' departments rely heavily on sophisticated equipment at each desktop. Sometimes, technical services staff require more than one workstation. Most processing units interact constantly with many networked library systems and with external bibliographic utilities including OCLC, RLIN, other utilities, and remote databases. To work effectively, staff must have high speed cable connections with almost uninterrupted function. Many acquisitions offices engage in electronic commerce and in complex interfaces with campus accounting. Interlibrary loan units provide service through a combination of hard copy, photocopy, fax and digitized information. Even in newer buildings, technical units rarely receive technologically smart space. Square footage assignments should be based on recognition that these functions require more space than before. Work areas for para-professional staff may need to be larger than suggested by current formulas. Previous space allocation relied on hierarchical distinctions. For libraries engaged in team structures, each staff member's work area must allow for any of the task they might do. Occasionally, this might mean a square footage equal to a higher-ranking staff member who is not totally reliant on electronic information for their managerial work.

---

**"Even in newer buildings, technical units rarely receive technologically smart space."**

---

Circulation increasingly takes place online, as part of the integrated library system. The placement of automated circulation illustrates another design problem in planning technologically enhanced space. Traditionally, the circulation desk has been near the library exit. Now, signals from the circulation system may disrupt those of the theft detection systems! Many similar examples of dueling wiring and signals occur, requiring librarians to develop new automation expertise.

Library systems offices resulted from library automation and the increased need for reliable in-house systems support. Systems staffs respond to problems and questions at workstations placed throughout the library and must be able to reach the cabling and power supplies for the building. The systems department rarely

occupies space designed for its operations. Space for systems staff should have adequate wiring, workspace for testing and configuring new machines, and secure storage. Good environmental controls are also needed. Establishing a digitizing center represents the latest introduction of technology into the library. Whether part of the systems office or of the preservation office, a digitizing lab or center must be provided with sophisticated cabling, lighting, and humidity/ventilation/air conditioning (HVAC) controls. If the systems office includes the library's digitizing efforts, then areas for training and demonstrating should be included in the design.

Managers might evaluate what technical services could be moved from the library building, if adequate properly configured space is not available. Collections and reference workstations will always be central to the library's public interface, but acquisitions, cataloging, and other materials processing functions could be housed in remote locations. A library with an integrated system and a good campus network, is no longer tied to a central physical catalog for daily operations. Digitizing and microform production centers do not have to be in the library. Moreover, flexible work schedules and the ability to work from home may give the library good alternatives for processing units. The library might also gain efficiency and save capital costs by permitting staff to share jobs. Scheduling work on shifts ensures that equipment is effectively used throughout the day. Using these options will reduce the space needed for operations.

### CONCLUSION

The library building program should carefully delineate the roles of each room in the building and the technology used in each. If electronic information does not supplant printed information, how do managers creatively encourage readers to refer to both sources? If technology is a means of access, does it extend a student's ability to learn, and does it enhance the learning process? Or, does it become a \$2000 notebook, drawing pad, and diversion from study.

Overall, library space planning will need to consider user driven solutions that may not be widely applicable across systems or locations. As the idea of mass customization is more widely described and carried out, space planning changes.

How do distance learning and life long

learning affect library space planning? Readers may rarely come to the library. Instead they may seek online information and request an interlibrary loan by e-mail or fax. The library will meet those needs by providing fax or digitized information. Another library patron may need access to rare materials that the library provides in CD-ROM format. The library, while still a place, is now a virtual place. The virtual library has most of the traditional library functions: organization and access to information, reference inquiries, and demands for interlibrary loan and circulation. Acquisitions, cataloging, and preservation staff are all involved in its construction and maintenance. Researchers may interact with library staff and each other by e-mail and video conferencing. In a virtual library as in a traditional one, visitors need community meeting rooms and classrooms.

Perhaps the best way to plan library space at the beginning of the 21<sup>st</sup> century is to think about the virtual library when planning the renovation of its reality counterpart. What can take place as effectively in the online environment? What services are less effective? What may be presented even more effectively on line? Good design relies on answering each question. Rather than providing uneasy co-existence, this visionary shift allows the library to operate on two levels. Both the physical library and the virtual library are part and parcel of service. Both have their own special spaces and are developed simultaneously.

Despite the presence of campus computer centers and learning centers in libraries, true co-existence between the virtual and physical library remains an ideal. In recent years, librarians inserted technology into quickly retrofitted space to meet the demand for electronic information. For some readers, searching the Internet has become more familiar than tra-

ditional classification schemes. For them, the types of linkages possible from a Web site are not easily achieved in the stacks. As computers become smaller and more portable, new intelligent buildings will be designed for wiring to allow anyone to "plug and play." Retrofitting older structures remains challenging and costly.

---

**"The need to integrate digital and traditional collections, physically and, more important, philosophically is pressing."**

---

The need to integrate digital and traditional collections, physically and, more important, philosophically is pressing. For the present, academic libraries will err on the side of collections, but incorporate technology based on the campus learning process. Printed works and electronic versions both occupy the library for now. How readers use one or the other shifts depending on societal values, societal needs, and the changes in technology. The effective library manager is one who develops a rationale for the particular arrangement of spaces at a given time through defining what really happens in the library to support readers. Library managers must gaze into a cloudy crystal ball for the most transient glimpse of the possibilities. By designing for maximum flexibility in any space, perhaps the wise librarian may shape the co-existence of the virtual and traditional in the future.

#### NOTES AND REFERENCES

1. TULIP Final Report (New York: Elsevier Science, 1996), (<http://www.elsevier.nl/homepage/about/resproj/trmenu.htm#ExecSummary>) (Accessed June 8, 2000).
2. Consortium for Educational Technology for University Systems, *The Academic Library in the Information Age: Changing Roles* (Seal Beach, CA: The Trustees of the California State University, 1997), p. 2. ([http://www.cetus.org/acad lib.pdf](http://www.cetus.org/acad_lib.pdf)) (Accessed June 8, 2000).
3. Richard W. Boss, *Information Technologies and Space Planning for Libraries and Information Centers* (Boston, MA: G.K. Hall, 1988), p. 25.
4. Aaron Cohen & Elaine Cohen, *Designing and Space Planning for Libraries. A Behavioral Guide* (New York: Bowker, 1979), p. 75.
5. What's Your Log-on Locale? (Washington, D.C.: PRNewswire), (August 13, 1997).
6. Building Blocks for Library Space, Functional Guidelines (Chicago: American Library Association, Library Administration and Management Association, Buildings and Equipment Section, Functional Space Requirements Committee, 1995); Ruth A. Frahley & Carol Lee Anderson, *Library Space Planning: A How-to do-it Manual for assessing, Allocating and Reorganizing Collections, Resources and Facilities*, 2nd. ed. (New York: Neal-Schuman, 1990); Roberta Friefeld & Caryl Masyr, *Space Planning in the Special Library* (Washington, D.C.: Special Libraries Association, 1991); and William W. Sannwald, ed. *Checklist of Library Building Design Considerations*, 3rd ed. (Chicago, IL: American Library Association, Library Administration and Management Association, 1997).
7. Cohen & Cohen, p. 123.
8. Philip D. Leighton & David C. Weber, "The Influence of Computer Technology on Academic Library Buildings; A Slice of Recent History," in *Academic Librarianship, Past, Present and Future: A festschrift in Honor of David Kaser*, edited by John Richardson & Jinnie Y. Davis (Englewood, CO: Libraries Unlimited 1989), p. 14.
9. *Ibid.*, p. 23.