

Report of the Task Force on Library Space Planning

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1.0 Introduction

As the twentieth century draws to a close, academic libraries are undergoing a significant evolution. After decades of development, a new type of library that is heavily dependent on information technology is emerging. This “digital library” will not abandon the legacy of over five centuries of the printed word: for the foreseeable future, print will play an important role in scholarship. Rather, the digital library will greatly enhance expedited access to print materials at the same time that it provides access to a growing array of electronic materials.

The University of Houston Libraries have made significant progress in building innovative electronic information services, while continuing to strengthen the conventional book and journal collections. However, as electronic information services have expanded and new print volumes have been added, general-use seating in the M. D. Anderson Library has dropped more than 54% since the 1985/86 academic year, and it could be completely eliminated by 2005/6. Without the construction of a new library wing, there will not be adequate space to add new computer workstations, house the growing collection of books and journals, and provide needed single-user and group study space.

Even if conventional print publishing was going to be fully replaced by electronic publishing in the next twenty years, these concerns would still be valid because they would need to be addressed during the transition period from print to electronic publishing. However, given a complex array of factors, it appears far more likely that, although electronic publishing will significantly grow in importance during this period, it will coexist with, rather than replace, print. Consequently, the University Libraries must plan for a future that includes both print and electronic information.

Because they raise the possibility of eliminating the need for a physical library, digital library and electronic publishing developments need to be carefully evaluated as a key part of any new library building proposal. The health and prospects of conventional print-based publishing and library services must also be assessed. As electronic information resources, manuscripts, and archival materials have become increasingly important, the Libraries have increased their related instructional efforts, and the space implications of this trend must also be evaluated.

This report:

Presents a brief history of the digital library, discusses its development at the University Libraries, evaluates barriers to its future development, and assesses whether the Internet can be considered to be a digital library.

Analyzes print publishing trends, summarizes the growth of the University Libraries' collection, and discusses the resulting decline in available general-use seating.

Considers library instruction trends and the adequacy of existing classroom facilities.

Recommends the construction of a new library wing on the M. D. Anderson Library (as well as the renovation of the existing facility), and provides a list of general design goals that should be met by this construction project.

2.0 The Emerging Digital Library

After over thirty years of sustained effort, the digital library is becoming a reality. By providing a growing amount of index and source information in electronic form, the digital library can deliver needed information to offices, dorm rooms, and homes via computer networks and telephone lines. It can speed the research process by providing powerful search tools, hypertext links between related information, and downloading capabilities. It can make it easier to identify needed printed materials and to request that these materials be quickly delivered to the user.

These are significant accomplishments, but a wide variety of difficult issues must be addressed before the digital library can develop to the point where electronic scholarly information begins to displace print information in any significant way, and this is likely to be a long process.

2.1 A Brief History of the Digital Library

From the late 1960s to the early 1980s, a gradual process of automating internal library functions led to the development of the integrated library system, which provides for many key internal operational functions via a single system and provides a public online catalog.

At the same time, important centralized services were established and matured. Bibliographic utilities supported shared cataloging, interlibrary loan, and other activities. Database vendors provided access to index databases. These services, which were accessed via specialized telecommunication networks or dial-access, were primarily used by librarians.

In the late 1980s, CD-ROM technology and local area networks made it cost-effective for libraries to provide users with direct access to electronic reference works, such as indexes, and to a limited amount of full-text source material that was primarily from journals.

In the early 1990s, the rapid development of the Internet and the World-Wide Web had a major impact on scholarly communication and academic libraries. A key factor that had previously inhibited electronic scholarly communication was the lack of a network with a critical mass of users and an easy-to-use nonproprietary interface to information on that network. The Internet and the Web addressed these critical problems, and they facilitated the development of a number of new scholarly tools, including: electronic journals,

books, and other materials published by both scholars and traditional publishers; document delivery services that provide rapid access to journal articles; discussion lists; a wide range of reference materials from government and other sources; and library Web sites and Internet-accessible online catalogs. They also provided an alternative delivery mechanism for existing resources, such as index databases.

Today, technologically advanced libraries, such as the UH Libraries, are providing integrated access to a wide range of local and Internet-accessible resources on networked microcomputers.

2.2 Public Electronic Information Services in the UH Libraries

The University of Houston Libraries are a recognized leader in providing electronic information services to faculty, staff, and students. The Libraries have been a pioneer in developing such services, and they have one of the most sophisticated electronic information service programs in the world. To a large extent, these services have been funded with student library fees and grant funds.

2.2.1 The Electronic Publications Center

In 1988, the University of Houston Libraries opened its innovative Electronic Publications Center (EPC), which offered access to nine CD-ROM databases on seven stand-alone microcomputers. At the time, the EPC was a pioneering service at the forefront of an important library movement to let students and faculty search key electronic citation databases themselves, rather than have librarians do these searches for them utilizing expensive, hard-to-use online databases. A significant phase in the rapid growth that followed was the Libraries' federally funded Intelligent Reference Information System (IRIS) project between 1989 and 1991, which made nineteen CD-ROM databases available on eight networked microcomputers. The IRIS Project was selected by EDUCOM's Educational Uses of Information Technology Program as an outstanding higher education information technology project in the Joe Wyatt Challenge contest.

The EPC currently provides access to over seventy networked electronic information resources, including CD-ROM databases, databases on Internet-accessible systems, online catalogs, document delivery systems, the Libraries' World-Wide Web and Gopher servers, and locally developed systems to help users understand library services and select appropriate research tools. These electronic resources, which have been carefully selected to support the University's core curriculum, are available on ninety-seven networked microcomputers. Information from over 3,500 journals and other full-text sources covering business, engineering, multidisciplinary, and social science topics can be printed on-demand using page-image CD-ROM databases on fourteen networked and two stand-alone microcomputers. Hundreds of U.S. Government CD-ROMs and a growing collection of specialized CD-ROMs are available on two stand-alone microcomputers. A subset of EPC resources are also available on the campus Ethernet and off-campus via dial-access. The World-Wide Web and Gopher servers are available on the Ethernet, off-campus via dial-access, and on the Internet.

A state-of-the-art, UNIX-based INNOPAC integrated library system provides users with a sophisticated online catalog and access to other Houston-area online catalogs. The INNOPAC system is available in the EPC on all regular networked EPC microcomputers and on seven additional networked microcomputers dedicated to online catalog access. It is also available on the campus Ethernet, off-campus via dial-access, and on the Internet. (This system also supports a variety of staff functions, such as acquiring, cataloging, binding, and circulating library materials and controlling the journal collection.)

With over 120 workstations, the EPC is one of the largest and most sophisticated academic electronic information services in the country. In the 1995/96 academic year, EPC resources were used over 832,000 times. In peak periods, the utilization of the World-Wide Web server by UH and Internet users has topped 250,000 uses per month. The astonishing growth of EPC services since its establishment is illustrated by a comparison of current activity with 1988/89 use statistics, which totaled approximately 13,500 uses for the entire year.

Table 1. EPC Electronic Information Use

1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
13,595	25,264	77,031	77,263	131,971	423,606	578,491	832,644

Utilizing the EPC, students and faculty can:

Search for article citations in a variety of disciplines and broad areas of study, such as agriculture, art, applied science and technology, biology, biotechnology, business, chemistry, Chicano studies, computer science, economics, education, engineering, geology, history, humanities, literature, mathematics, medicine, physics, public policy, psychology, science, social science, and sociology.

Search and read the ASCII full text of book reviews, conference proceedings, encyclopedia articles, journal and newspaper articles, radio scripts, and other information.

Print digital page-images of articles from scholarly journals, popular magazines, conference proceedings, and other information sources.

Request that journal articles be quickly faxed to them or delivered by other means.

Locate detailed corporate information, such as balance sheets, cash flow statements, and

financial ratios.

Access Congressional bills, economic and trade statistics, federal regulations, and a wide range of other government information.

Search the collective holdings of eight local research libraries (such as Rice University and Texas A & M University) with a single command.

Retrieve information on over 34,000,000 books and other materials held by over 21,000 libraries from a central database.

Utilize a carefully selected and organized collection of Internet resources to access electronic books, journals, online catalogs, technical reports, and an incredible diversity of other information, or just explore the full spectrum of Internet resources using general-purpose finding tools.

2.2.2 Electronic Resources in the Libraries' Branches and Other Locations

Each branch library of the University Libraries has public microcomputers that provide access to the INNOPAC online catalog and to a selection of networked EPC electronic resources that are appropriate for that branch. Each branch library also has additional specialized CD-ROM databases. There are ten of these CD-ROM databases in the branch libraries.

The INNOPAC online catalog is available on a variety of other public microcomputers located in the M. D. Anderson Library, including selected workstations in the Current Journals, Interlibrary Loan, Special Collections and Archives, and Reserves units. Public access to networked EPC resources is also available in the Interlibrary Loan and Special Collections units.

The Current Journals unit houses twenty stand-alone microcomputers that are used for general-purpose computing applications, such as word processing.

2.2.3 Electronic Publishing Activities

Since 1989, the Libraries have been a prominent electronic publisher on the Internet. The Libraries sponsor the popular PACS-L and PACS-P lists; *Public-Access Computer Systems News*, an electronic newsletter; and *The Public-Access Computer Systems Review*, a refereed electronic journal. The Libraries' staff also maintain a variety of popular World-Wide Web pages on specialized subjects.

The Libraries' electronic information services have dramatically improved the speed and cost-effectiveness of library research in ways that would have been inconceivable just ten years ago. In the future, the University of Houston Libraries will continue to build innovative, new information services that will transform the library as we know it.

2.3 Factors That Inhibit the Development of the Digital Library

The digital library promises dramatic improvements in academic library services; however, its development is being slowed by a variety of factors.

2.3.1 Immature Electronic Publishing Business Models

Commercial publishers, professional associations, and university presses provide the bulk of scholarly information in print form. Professional associations typically use profits from publishing activities to help subsidize other organizational activities. In recent years, university presses have been encouraged to operate as profit centers, rather than relying on university subsidies. Consequently, all three types of publishers are concerned with generating profit.

Although a growing number of scholars are starting electronic journals and engaging in other electronic publishing projects, it seems likely that traditional publishers will continue to provide most scholarly information in the future. Current projects are largely small-scale experimental efforts with short histories. It is unclear how long they will be sustained, especially as the Internet becomes more heavily regulated, and it is unlikely that they can be scaled-up to production levels similar to those of conventional publishers without significant expansion of their resource bases.

Scholarly publishers have mature business models for print publications. Electronic publications are significantly different than printed ones, and new business models must be developed to deal with the novel issues that these products raise.

One issue is the ease of copying electronic information. A printed book or journal is typically used by one person at a time in one location. While photocopying a complete book or journal is not impossible, it is time consuming and relatively expensive. These use restraints are not present in electronic documents distributed via computer networks. An electronic document can be used by many simultaneous users in many locations. Copying is easy, instant, and virtually free.

Publishers feel that there is already too much uncompensated use of print materials through photocopying and interlibrary loan. Consequently, when faced with the prospect of shifting to an electronic medium that could make this problem significantly worse, they become very concerned with access control issues.

Academic libraries want their users to be able to freely access electronic information anywhere, twenty-four hours a day. Publishers want to ensure that libraries only provide electronic information to faculty, students, or staff. They do not want academic libraries

to undercut sales by distributing electronic information to other potential customers, such as community businesses. Technological methods for effectively restricting access to electronic information are immature, creating problems for both publishers and libraries.

As a result of these factors, electronic information is typically licensed, not purchased outright. Reflecting the early state of the electronic information marketplace, the terms and conditions of licenses can vary a great deal from publisher to publisher. Use restrictions are determined by the license, which is a contract. Unlike printed materials, the library does not own electronic materials, and typically it cannot lend them via interlibrary loan as it can print materials. Publishers can place limits on whether users can print, store, or redistribute electronic information. It is unclear whether libraries will be able to permanently archive electronic information that they do not own in order to preserve it, should its publisher go out of business.

Publishers are also attempting to develop pricing models that will allow them to make a healthy profit from electronic publishing without prematurely undercutting the market for print products, which are their primary income source. Electronic publishing requires publishers to build new technological and personnel infrastructure and to engage in R&D. Consequently, the cost of electronic materials is often higher than their print equivalents, and costs can have considerable variability from publisher to publisher.

In recent years, many publishers have agreed to flat-rate annual fees that allow libraries to budget for electronic information use. (By contrast, unpredictable use-based costs mean that libraries must stop access when funds run out.) However, flat-rate fees could be threatened by emerging electronic commerce systems, which offer publishers more flexibility than they now have to gather per-use fees.

Lack of stable electronic publishing business models leaves publishers uncertain about whether to develop products and unclear as to how to price, market, control, and deliver them. Libraries must deal with a highly inconsistent, fragmented marketplace that requires product-by-product financial, legal, and technical evaluation; negotiation with vendors; and unique implementation considerations.

2.3.2 Conversion of Printed Materials

The vast majority of scholarly information in academic libraries is in printed form. For the physical library as a public facility to cease to exist, all new materials would need to be published in digital form, and all older printed materials would need to be converted to digital form (unless some print materials were deemed useless and were discarded). Even then, users would need appropriate computer workstations and peripherals in their dorm rooms, offices, and homes that were linked to the digital library by high-speed network connections. Remote users would also need interactive digital video links to library staff so that they could get research assistance.

How feasible is it to convert the printed materials held by academic libraries to electronic form? The Library of Congress' National Digital Library Program provides a case study.¹ It is digitizing five million items (these items are primarily personal papers and other types of archival material found in special collections) at an estimated cost of \$60 million. It is estimated that the per-page cost of conversion is between \$2 to \$6. This is the largest scale conversion project ever undertaken by a library; however, it is digitizing only about 4% of the Library of Congress' 110 million item collection, and these are older materials whose conversion is generally not complicated by copyright issues. The archival materials being converted also typically have much lower page counts than books and journals (e.g., a two-page letter may be one "item").

In 1994-95, the 108 academic libraries that were members of the Association of Research Libraries collectively held 356,411,095 volumes.² The eleven non-academic member libraries held an additional 58,486,602 volumes, for a total of 414,897,697 volumes. These collections overlap to some unknown degree, but they can be assumed to contain unusually high percentages of unique material. The cost of converting the collective collection of these largest North American research libraries would be staggering even if copyright was not an issue, which it will be for most twentieth century material. For copyrighted materials, the copyright holder will need to be located and permission will need to be secured before digitization can take place. It cannot be assumed that copyright holders will be easy to locate or willing to permit conversion if located. It is likely that granting conversion permission will be contingent on fee payment and the successful negotiation of license agreements.

Another conversion issue is that scholars value and want to study the printed work as an object. A digital copy is not an acceptable substitute for the original work. Rare works also have economic value and are unlikely to be discarded even if they are converted.

Given the expense, complexity, and legal difficulties associated with digitization, academic libraries are likely to convert only a small subset of their print collections to digital form.

Since publishers have been using computers to support their operations for some time, it might be assumed that this would speed the conversion of materials published in latter part of this century. However, since the goal of early systems was to speed the print publication process rather than to facilitate both print and electronic publication, these systems used proprietary electronic formats, graphics were not typically encoded and laid out in electronic form, corrections were made to final print masters that were not then made in the electronic files, and electronic information was not always saved. It is only in recent years that major publishers have started permanently storing information—both text and graphics—used in the print publication process in standard, reusable electronic formats. Consequently, publishers face a similar conversion problem to that of libraries.

2.3.3 Copyright

In recent years, rapidly increasing serials costs have strained academic libraries' collection budgets. This has resulted in increased scrutiny of the scholarly journal publishing system, causing many critics to note that universities pay scholars to write articles, scholars turn their copyright to these articles over to publishers, and, with these copyrights in hand, publishers sell the articles back to universities at high cost in the form of journals and article reprint rights. Calls for reform, including the possibility of universities assuming the role of electronic publishers, have grown more frequent, but, so far, universities are taking little concrete action. Nonetheless, publishers are concerned, and this trend heightens uncertainty about how scholarly electronic publishing will evolve.

The issue of who should control scholarly publishing is likely to be aggravated by an upsurge of copyright reform activity at the national and international levels. This activity has been driven by publisher concerns over the protection of copyrighted works in the Internet and other network environments. Typically, proposed reforms significantly expand copyright holders' rights to control electronic information, while weakening libraries' and scholars' rights to utilize and redistribute it. Should such legislation be enacted, a scholarly information system could evolve where printed materials can be more freely used than electronic ones.

When producing computerized multimedia or other composite works, both publishers and scholars have discovered that the process of securing copyright permissions for the inclusion of images, video, and other types of information is complex, time consuming, and potentially expensive. This has hampered the development of these products.

Copyright is the foundation of the existing publishing system. Without difficult-to-reach consensus about how the rights of readers and publishers can be fairly balanced in the electronic environment, scholarly electronic publishing will not be an adequate substitute for print publishing.

2.3.4 Censorship

In addition to copyright issues, national, state, and international governments are increasingly attempting to regulate other aspects of electronic communication on the Internet and other networks. Although the range of issues seems to grow daily, censorship of electronic information is a key concern of academic libraries. An important example of this trend is the Communications Decency Act (CDA), twice struck down by lower courts and now on its way to the Supreme Court, which would impose severe legal penalties for allowing minors to access “indecent” electronic materials. Since many materials needed for education and scholarly research may be viewed as indecent (e.g., pictorial or descriptive information about human sexuality or artistic representations of nudity), this law could have a chilling effect on library electronic information services. Whether the CDA is struck down by the Supreme Court or not, legislative attempts to censor electronic information are likely to continue, potentially resulting in a scholarly information system where printed works have more legal protections than electronic ones.

Scholarship and instruction cannot be effectively conducted via electronic means if they must be restricted to dealing with works that are acceptable to the most conservative members of society.

2.3.5 User Acceptance

Without question, electronic publishing has been a great boon for many researchers. Electronic indexes and other electronic research tools have speeded up the research process and permitted more location-independent research. As consumers, users seem to have few complaints.

As electronic publishing matures, more source materials, such as journals, are being published in electronic form. When faculty assume the role of authors, the question arises as to whether publication of a work in electronic form is fully equivalent for the purposes of promotion and tenure to publication in print form. This is an issue for refereed electronic journals because they are both new journals and they are published in a new medium. In the print world, authors prefer to publish in well-established, widely read, prestigious journals. Electronic journals are not yet perceived as first-tier publications, and it is unclear how long it will take for this to occur. There are also issues related to the permanence of electronic journals and their accessibility via finding tools such as indexes (some older electronic journals are now indexed, but many others are not).

Another key aspect of user acceptance is that different disciplines rely on different types of information. For example, a physical scientist may believe that current preprints and articles are the most important source of scholarly information, but a humanist may feel that books published between the fifteenth century and the present perform this function. Since journals are likely to migrate to electronic form before books and many older books may never be in digital form, the scientist in this example may feel that electronic information is far more valuable than the humanist, and this could affect their respective attitudes about the acceptability and validity of electronic publishing.

There may be challenges associated with the acceptance of electronic journals, but at least they represent a transformation of an existing form of scholarly communication. As electronic publishing matures and its true potential is realized, scholars will produce new types of electronic documents that are not based on older print-based models. These new documents will be even harder to judge by conventional standards.

For scholarly electronic publishing to flourish, scholars must feel that it is equivalent to print publication, and they must be rewarded for publishing in this medium.

2.3.6 Technological Infrastructure Requirements

Books and other printed works are high-resolution, portable information storage devices with a familiar user interface and no expensive, complex technical support requirements. Electronic information has unique capabilities not found in print, but poses many challenges that print does not.

Unlike print information, electronic information dissemination relies on a complex and expensive technological infrastructure. Rapid technological obsolescence aggravates this problem. Given the relentless pace of change in the computer industry, the definition of an “adequate computer platform” for producing, delivering, and utilizing electronic information is a moving target, and hardware and software must be replaced on a regular basis to continue to provide needed functionality. The useful life of computer hardware and software is shortening as the pace of change quickens.

As noted earlier, publishers must invest in sophisticated publishing systems and deal with a variety of technological issues in order to engage in electronic publishing. Another infrastructure issue that affects them is that the scholarly publishing market is global; however, customers in developing countries may not have access to the computer and network technologies needed to take advantage of electronic information products. Even in many developed countries, Internet access can be more difficult and expensive to obtain than it is in North America. Consequently, publishers cannot abandon print until the majority of their customers can effectively utilize electronic information, and, until this occurs, they must bear the added costs of electronic publishing on top of existing print publication costs.

Academic libraries must struggle to absorb growing software, hardware, network, and data costs in their budgets while continuing to perform their traditional print-oriented missions. While some commercial electronic publishers are supporting standard-based access to information (e.g., Web access and Z39.50), many require that proprietary software be used to access their products (this is especially true of CD-ROM vendors). This, combined with the need to restrict access to conform to license agreements and to count accesses for record keeping purposes, results in academic libraries having to act as system integrators for a growing number of vendor products. To provide users with an easy-to-use, menu-driven environment, libraries must construct and maintain technically complex network software and hardware environments. It is unclear how long it will be

(if ever) before this is unnecessary given the unpredictable nature of information technology development, where “straight-line” future projections often fail.

Of course, academic libraries do not provide the campus-wide infrastructure that is needed to fully support electronic information services. They rely on academic information technology units to provide centralized services, such as a reliable high-speed campus network, Internet access, dial-access modem pools, and general purpose computer clusters. Information technology units face significant challenges to build, maintain, and support needed campus-wide services.

With a robust campus-wide infrastructure in place, users can access electronic information resources from their offices, dorm rooms, and homes as long as these locations are equipped with an appropriate computer workstation that has a network connection or modem. For students and other users who cannot afford to purchase, upgrade, and periodically replace this equipment, remote access will be impossible or ineffective.

As any World-Wide Web user knows, there is a significant difference in transmission speed between on-campus network access and dial-access. While technologies for significantly improving home access speed, such as cable television modems, are emerging, improvements in campus networks and Internet connectivity may result in a continuing performance gap between on-campus and home access.

Given the display capabilities of current computer monitors, few users are eager to read long documents sitting at their computer, especially if they are using portable computers. Consequently, many electronic documents are printed for reading purposes, and the ability to quickly print documents on high-resolution printers is an important factor in electronic document use. Users may not have access to such printers in their offices, dorm rooms, and homes. When academic libraries provide such printers, the issue of growing printing costs must be dealt with.

While printing permits document portability, some capabilities of electronic documents can be lost in the process. For example, a long electronic document may have numerous hypertext links to remote Internet sites. Hypertext navigation is lost when the document is printed.

Until all users have high-speed access to electronic information resources using networked workstations in remote locations, a large number of workstations are needed in the library, and, the fewer users who have this access, the more workstations the library must supply.

2.3.7 Standard Information Formats

To provide needed capabilities, electronic information is often encoded in special formats. For example, word processors use proprietary file formats. Unfortunately, these formats can become obsolete, and, if data is to survive, it must be regularly converted to new formats. Standard data representation formats, such as SGML, are emerging that will help address this issue; however, they are often complex and they, too, evolve over time, requiring that older files be updated.

2.3.8 Information Authentication and Integrity

When a scholar reads a printed book or journal, there is a reasonable degree of certainty that it is not a fake and that it has not been tampered with. Such assurances are not yet

common in the electronic information arena. Given the ease with which electronic information can be copied and edited, it can be altered and republished on the Internet and other networks in ways that make detection difficult. Technological strategies to deal with these electronic information authentication and integrity problems, such as public key encryption, are emerging, but are not in common use.

A related problem is that the author of an electronic document may change it without notification. If different versions of a document are not clearly identified and preserved, scholars cannot accurately quote from them or cite them.

Print-based scholarship has relied on the existence of an official, unchanging body of literature. For electronic scholarly publishing to flourish, existing information authentication and integrity problems must be solved.

2.4 The Internet Is Not a Digital Library

As the Internet has gained popularity, it has become increasingly common to hear it referred to as a “digital library.” Without question, there are vast amounts of electronic information available on the Internet; however, it is not a “digital library.”

Libraries—digital or otherwise—perform certain key functions that are not present in the Internet environment:

Selection: Academic libraries carefully evaluate books, journals, and other materials for inclusion in their collections. Librarians, who are typically subject specialists, make judgments about whether scholarly materials will meet the specific information needs of their faculty, students, and staff. Faculty suggest needed books and journals. The world of published information is vast; the collection of an academic library is a filtered subset of highly relevant information that is designed to meet the needs of the university community. Materials are housed in the library so that they can be accessed quickly when they are needed. The Internet is an enormous, unfiltered collection of information, much of which is of marginal or no academic relevance. Since anyone who is authorized to distribute information on an Internet server can be a publisher, information is not necessarily validated as it typically is in conventional publishing, and, consequently, it may not be correct.

Organization: Academic libraries catalog books, journals, and other library materials using well-established rules and subject classification schemes. The goal is to make information easy to find in the online catalog and to facilitate browsing of the stacks by shelving like items near each other. Libraries also provide a variety of indexes and other finding tools for locating information. While many automated search engines exist on the Internet, their ability to quickly pinpoint needed information is fairly weak. Some major human-constructed directories of information exist, but they are geared to general information needs rather than scholarly ones and information is not described in a consistent way. A variety of specialized directories constructed by scholars and libraries exist, but finding them is difficult.

Research Assistance: Academic libraries provide reference desks staffed with subject experts trained in finding scholarly information to assist users with their research. They provide interlibrary loan and document delivery services to obtain needed information from off-campus agencies. They also teach users how to utilize library resources and systems in formal classes. Internet users can ask other users for help via lists, but the availability of assistance and its quality when received is uncertain.

Preservation: Although academic libraries regularly discard some materials that are no longer relevant, the vast majority of library materials are preserved forever. The only social institutions that have the permanent preservation of scholarly information as a core mission are libraries and archives. Publishers will only preserve information as long as there is economic benefit. There is no guarantee that anything on the Internet will be there in twenty minutes, much less in twenty years. If information is preserved, it is because the providing agency has a commitment to do so.

Although the Internet is not a digital library, it does contain a significant core of useful information. As noted earlier, it has had a catalytic effect on library electronic information services. Part of the mission of real digital libraries is to select, organize, and preserve this information and to help users effectively utilize it.

3.0 The Print Library

Given the explosive growth of the Internet and the growing accessibility of electronic information in academic libraries, it is easy to lose sight of the fact that scholarship continues to rely on books, journals, and other conventional materials as its primary source of information.

3.1 Print Publishing is Alive and Well

In 1980, 562,500 book titles were published in the developed countries of the world. By 1990, the number of titles had grown to 600,000.³ In developing countries, the comparable figures were 153,000 and 242,000 titles. There are no authoritative statistics for electronic book publishing (many of which are simple ASCII files), but a generous estimate would place the total annual production at less than one-quarter of 1% of all books published.

Table 2. Book Title Production 1980-1990

Publication Source	1980	1990
Developed Countries	562,500	600,000
Developing Countries	153,000	242,000
Total	715,500	842,000

The world's total serials production grew from about 70,000 titles in 1971 to over 118,500 titles in 1991.⁴ (A "serial" is a journal, magazine, newsletter, or similar publication.) In 1991, there were 110 electronic serials (about nine-tenths of 1% of serials production in that year).⁵ By 1995, there were 675 electronic serials—a dramatic increase, but still a fraction of the world's serials output.⁶

Table 3. Serial Title Production 1971-1991

Type of Serial	1971	1991
Print	70,000	>118,500
Electronic	0	110

Reflecting the importance of print publishing, academic libraries continue to spend the bulk of their collection materials budgets on conventional books and journals. In 1994-1995, academic libraries spent \$672,082,144 on books and serials; however, they spent only \$37,562,595 on machine-readable materials and database fees.⁷

Table 4. Selected Academic Library Expenditures 1994-1995

Books	Serials	Machine-Readable	Database Fees
\$263,144,041	\$408,938,103	\$20,866,779	\$16,695,816

Far from dying, conventional print publishing continues to dominate scholarly communication. Without question, electronic information will grow in importance; however, until it completely replaces print (if this ever occurs), academic libraries must continue to purchase and store printed materials.

3.2 The University Libraries' Print Collection

Reflecting the ongoing importance of printed materials, the University Libraries' collection of books, journals, and other non-electronic materials has grown steadily in the last fifteen years, and this trend is continuing. The Libraries' Special Collections and Archives unit is experiencing unusually fast growth, and, since there is inadequate space to house existing rare and archival materials, one collection has already had to be moved to an off-campus location. General purpose seating has dropped sharply as print collections displace study areas, and the M. D. Anderson Library will not be able to accommodate anticipated collection growth over the next twenty years, even if all general purpose seating is eliminated.

3.2.1 Collection Growth

The University's total library collection (including the collection of the University Libraries and the Law Library) grew from 1,225,941 volumes in 1979/80 academic year to 1,846,757 volumes in 1994/95. This collection growth figure reflects increased acquisitions funding in the early 1980s, followed by a sharp decline in the mid-1980s to the late 1980s, followed by an increase in funding from the early 1990s to the present (supported by student fees).

Table 5. Volumes in the University Libraries and the Law Library

1979/80	1982/83	1985/86	1988/89	1991/92	1994/95
1,225,941	1,360,084	1,485,706	1,598,010	1,681,558	1,846,757

3.2.2 M. D. Anderson Library Collection Storage Requirements

Each year, the University Libraries purchase new books and bind back volumes of serials. In the 1995/96 academic year, storage space was needed in the M. D. Anderson Library for an additional 35,593 volumes. (This count takes into account both additions and withdrawals to the University Libraries' collection, and it excludes changes in the Branch Libraries' and the Law Library's collections.) If this figure was unchanged, an additional 711,860 volumes would need to be stored in the M. D. Anderson Library by the 2015/16 academic year.

Table 6. Projected Volume Growth in the M. D. Anderson Library

1996/97	2000/1	2005/6	2010/11	2015/16
1,779,461	1,921,833	2,099,798	2,277,763	2,455,728

If a generous 10% rate was assumed for electronic materials displacing printed ones, space would still need to be found for 640,674 volumes by 2015/16.

Unfortunately, even the lower estimate cannot be accommodated in the M. D. Anderson

Library. As noted in the next section, collection growth to date has seriously diminished available study space in the library; however, the only option the library has for storing new volumes in the existing facility is to continue to remove seating used for study and research purposes to make way for book and journal stacks. Within ten years, this will not be an option because there will be no general-use seating left to displace.

3.2.3 General-Use Seating in the M. D. Anderson Library

As the collection has grown, general-use seating has been removed to make room for books, bound journals, and other materials. General-use seating is utilized for study and research purposes. It includes open study areas (carrels and tables), assigned individual studies, and group studies. Special-purpose seating in service areas of the library, such as the EPC, and in the library classroom is not under consideration here.

Approximately 2,100 general-use seats were available in the 1985/86 academic year. By 1995/96, that number had fallen to 964 seats, a 54% decline.

By 2000/1, it is projected that general-use seating will drop to 200 seats if current trends continue, and there could no general-use seating left by 2005/6.

Table 7. General-Use Seating in the M. D. Anderson Library

1985/86	1990/91	1995/96	2000/1	2005/6
2,100	1,152	964	200	0

3.2.4 Special Collections and Archives Expansion

The Libraries' Special Collections and Archives department has undergone unprecedented growth in the last few years, including the establishment of the University Archives (including the Women's Archives) and the Jagdish Mehra Collection. Given space constraints, the Mehra Collection is being housed off-campus.

Donations of personal papers and other materials are increasing, and it is anticipated that the University Archives collection will grow quickly as campus units submit materials. There is also the need to begin to move materials published before 1850, which are now considered to be rare materials, into Special Collections. Overall, a 57% increase in Special Collections and Archives storage space is needed to accommodate continuing collection growth over the next twenty years.

Special Collections and Archives materials must be housed in highly secure and strictly climate-controlled conditions. The current facility cannot even house the existing collection, and existing environmental controls are inadequate.

4.0 Instruction

As electronic information resources have proliferated, the Libraries have increased the number of classes devoted to teaching users how to employ these resources.

Table 8. Number of General Library Classes and Tours

1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
176	140	207	218	286	444

Table 9. Participants in General Library Classes and Tours

1990/91	1991/92	1992/93	1993/94	1994/95	1995/96
4,564	4,083	5,290	5,722	7,039	8,026

At the same time, the Special Collections and Archives department has made a concerted effort to teach users about conducting research with rare and archival materials.

Table 10. Number of Special Collections and Archives Classes

1990/91	1991/92	1992/93	1993/94	1994/95
14	14	14	26	32

Table 11. Participants in Special Collections and Archives Classes

1990/91	1991/92	1992/93	1993/94	1994/95
563	435	331	563	640

Most of these classes have an electronic information component. During peak periods, three or four classes have been conducted at once. Unfortunately, the Libraries only have one electronic classroom, which is equipped with seven networked microcomputers that have access to EPC resources. This classroom holds at most thirty students. Existing classroom facilities cannot meet current needs, much less accommodate increased instructional efforts in the future.

5.0 Task Force Recommendations

Based on the preceding analysis, the Task Force on Library Space Planning recommends that a 200,000 square feet, five-floor (plus basement) wing be constructed on the south side of the M. D. Anderson Library. It further recommends that the existing facility be extensively renovated.

5.1 Planning Assumptions

The Task Force adopted a twenty-year planning time frame for its discussions. Given the speed of evolution of information technology use in libraries and the unpredictability of its development (the emergence of the World-Wide Web as a transforming force is a recent example), this is a very long period to attempt prediction. However, the Task Force believed that it was reasonable to assume the following:

Scholarly electronic publishing will become far more significant, but print publishing will continue to predominate. Consequently, space must be found to house a growing collection of printed books and journals, manuscript collections, and archival material.

Remote use of electronic information will grow greatly, but it cannot be assumed that every student will have access at home or in his or her dorm room to an appropriate computer workstation attached to library information servers by high-speed network links. Rapid hardware/software obsolescence will continue to aggravate this problem. Consequently, the University Libraries will need to continue to expand the availability of in-library computer workstations.

Students will continue to want to study in the library, both alone and in groups. Consequently, given the inadequacy of the existing facility in this regard and the worsening of this situation as book stacks continue to displace user seating, new areas for study carrels, individual studies, and group studies are needed.

The rapid growth of electronic information resources has increased the need to provide classes about their use and the Libraries' instruction program will continue to expand to meet this need. Since current electronic classroom space is already inadequate, more electronic classrooms are needed.

Wireless networks will mature, but it is unclear if they will overtake wire-based networks in their speed, security, and reliability. Consequently, the new wing and the remodeled library should be designed (or modified) to facilitate laying network cable to any desired location.

Dedicated public computing areas could be developed to support new, specialized services such as electronic reserves, but it will be more cost-effective and convenient to provide a "one-stop-shopping" model where the user can access every type of needed information from every workstation.

5.2 General Design Goals

The following goals should guide the detailed planning of a new South wing and a remodeled existing facility (henceforth called the "new library").

5.2.1 Ubiquitous Public Computing

Given the growing importance of electronic information resources, 500 public networked computer workstations should be available in the new library (an increase of 350 workstations), group studies should be equipped with networked computer workstations, all other user study areas should be wired for network access via portable computers, at least three electronic classrooms should be available for library instruction purposes that have numerous networked computer workstations and interactive television capability (this is needed to support distance learning), and a large-group instructional facility with computer projection capability should be provided. One of the electronic classrooms should be located in the Special Collections and Archives department, so that rare and archival research materials can be used for instructional purposes without compromising the security of these items.

The South wing should be designed so that cable can be easily run to any point on the floor. The existing library should be remodeled to install drop ceilings where they do not currently exist. The types of cable to be run should be determined prior to construction based on technological considerations at that time.

5.2.2 Fewer Service Points

The existing library has seven major public service desks spread across eight floors: Circulation (first floor), Information (first floor), Current Journals and Microforms (first floor), Interlibrary Loan (first floor), Reserves (third floor), University Archives (seventh floor), and Special Collections (eighth floor). The Mehra Collection, which is part of Special Collections and Archives, is off-campus.

In the new library, the number of service desks should be significantly reduced, and the remaining desks should be located entirely on the first floor. The Task Force envisions three service points: User Services (Circulation, Current Journals and Microforms, Interlibrary Loan, and Reserves), Research Consultation (currently Information), and Special Collections and Archives (Special Collections, University Archives, and the Mehra Collection).

The service desks should be visible upon entering the library.

5.2.3 More Reader Space

As a commuter campus, UH draws students from the entire metropolitan area, and most students live too far from campus to leave between classes. Even if they are not using the library collection, students must take advantage of their time on campus to read their textbooks and complete other assignments. Those who carpool or use buses must conform to those transportation schedules, and they may not leave as soon as their last class has ended. Older students with families find it easier to schedule study time in the library than to study at home. Students who want to study together find that the library is the only place that is central to all of them. A significant increase in study space is required to meet user needs.

5.2.3.1 General-Use Study Seats

Students and other users need a quiet place to conduct research, write papers, and to study. Currently, there are 626 general-use study seats at either carrels or tables in the M. D. Anderson Library. These carrels and tables are very heavily used, and there is not enough seating to meet demand in peak periods.

The carrels that were recently added on three floors of the Brown Wing provide a good model for additional future general-use seating. They provide a large number of seats in a comparatively small area, and they effectively discourage groups from disrupting the quiet study atmosphere. They are the first choice of many students seeking study space in the library.

The new library should provide at least 720 additional general-use seats at open carrels and tables.

5.2.3.2 Assigned Carrels

Graduate students and faculty who are conducting in-depth research projects need an assigned study carrel, where they can store materials. The M. D. Anderson Library has 435 carrels assigned to these users. Once again, demand significantly exceeds supply.

The new library should provide at least 180 additional assigned carrels.

5.2.3.3 Group Study Spaces

The demand for group study is fueled by a number of trends in higher education:

Group study has been shown to be beneficial in improving the performance of "at risk" students.

Group assignments have become commonplace in certain disciplines.

Employers are encouraging educators to train their students to work in teams, so they will be prepared to perform in teams in the workplace.

Currently, there are ten group study rooms in the M. D. Anderson Library. These group study rooms are in great demand. There is also an area on the third floor that is informally given over to study groups, which has 338 densely packed seats at either tables or carrels. None of these study spaces are well suited for group use. There is a great need for group study spaces that are soundproof and are equipped with at least one networked microcomputer.

The new library should provide at least sixty additional group studies.

5.2.4 More Space for Books and Journals

To accommodate projected collection growth, the new library should house at least 2,500,000 volumes.

5.2.5 Relocated Staff Offices

Offices for Circulation, Current Journals and Microforms, Information Services, Interlibrary Loan, Reserves, and Special Collections and Archives (including the Mehra Collection) staff should be as close as possible to the service points they staff on the ground-level first floor.

If required to free up space for the consolidation of public service points on the first floor, offices for library administration, Bibliographic Services, and Systems staff should be moved to the second floor.

5.2.6 A Facility Tailored to Meet the Needs of Commuter Students

Since the University of Houston student body has a large percentage of commuter students, the new library should be designed to meet their special needs. For example, the new library could include student lockers or a check-room, a coffee shop with food service, a child-care facility, a drive-up book drop, and a twenty-four-hour study room.

6.0 Conclusion

The University Libraries are committed to building tomorrow's digital library; however, this library will include both print and electronic information resources. The library as a place will not vanish in the next twenty years—more library space will be needed to provide expanded electronic information access and instruction; house the growing print, manuscript, and archives collections; and provide user study space. To meet these needs, a new South wing should be constructed on the M. D. Anderson Library.

Notes

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2. Martha Kyrillidou, Kimberly A. Maxwell, and Kendon Stubbs, *ARL Statistics 1994-95* (Washington, DC: Association of Research Libraries, 1996), 28.
3. Jutta Reed-Scott, *Scholarship, Research Libraries, and Global Publishing* (Washington, DC: Association of Research Libraries, 1996), 29-30.
4. Anthony M. Cummings, Marcia L. Witte, William G. Bowen, Laura O. Lazarus, and Richard H. Ekman, *University Libraries and Scholarly Communication* (Washington, DC: Association of Research Libraries, 1992), 78.
5. Ann Okerson, ed., *Directory of Electronic Journals, Newsletters, and Academic Discussion Lists*, 1st ed. (Washington, DC: Association of Research Libraries 1991).
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Appendix A. Site Visit Reports

The Task Force for Library Space Planning investigated several recent research library construction projects in-depth. These construction projects were: (1) new library buildings at Case Western Reserve University, Indiana University-Purdue University Indianapolis, and the University of Southern California; and (2) additions and renovations at Emory University, the University of California at San Diego, the University of Oregon, and the University of Washington. Site visits were conducted at these libraries, and reports of these visits follow.

The Task Force also identified recent construction projects other research libraries, including Colorado State University, Queen's University, the University of British Columbia, the University of California at Irvine, the University of Kentucky, the University of Illinois, and the University of Michigan. Information about these projects

was gathered from Web sites and other sources.

Case Western Reserve University (Pat Ensor)

The Kelvin Smith Library, opened in the summer of 1996, replaces the Sears and Freiberger Libraries of Case Western Reserve University. The former Sears library was part of a building in the lower part of campus. It housed science and technology materials. The former Freiberger library was a separate building next to the new Kelvin Smith library. It housed arts and humanities materials. The Freiberger library was in especially poor shape (there was some discussion of renovating it, instead of building a new library, but funding sources were not interested). The need for a new library was considered in 1961 and 1972; however, both times the university administration determined that a new library was not needed because of the growth of electronic publishing.

In 1988, a new president stated in advance that he would make the new library a top priority, and he declared a self-imposed moratorium on new campus buildings to be over. In 1989, he organized a very high profile two-day conference on the library of the future. Participants from all constituencies were brought in from a national level. At the end of the conference, a university administrator stated, "We've just got to have a new library."

It was concluded that the transition from print to electronic would take sixty years, therefore it was worthwhile to build a new building. The university president committed \$25 million to the building. The Library of the Future Committee was formed. This faculty committee was chaired by the Dean of the Management School. The library director served on the committee.

The primary reason for building the new library was to accommodate the transition to electronic information, while providing storage for and access to a working print collection. There was a commitment to limit the number of volumes in the new building to 1.7 million. It currently holds 1.2 million volumes. This includes about 100,000 literature books that were transferred back from remote storage.

Library staff surveyed faculty, staff, and students. Users wanted the library to be a high-tech, comfortable, easy-to-use facility. They also wanted books to be brought back from remote storage.

A fiber optic network (CWRUNet) is the pride of the campus, and it shapes the perceptions of everyone at the university. Users wanted the library to be fully wired with fiber optic cable.

The new building—three floors above ground and one below, with 144,000 square feet—is a high technology oasis: calming and conducive to study, and wired for the future. It has become a fund-raising magnet.

Emory University (Charles Bailey)

The primary goal of the Center for Library and Information Resources was to create an integrated service environment for the University Libraries, Computing Resources Services (academic computing), and Multimedia Communications. There was also a need for more space and seating, and a desire to have a flexible, low-maintenance facility.

In June 1989, a planning committee of faculty, information technology staff, and media staff (chaired by the Director of Libraries) was established. The initial change was to develop a plan to renovate the Candler Library. As the project evolved, the focus was broadened to a more general consideration of space needs. At this stage, the committee was examining the distribution of services between the Candler Library, the Woodruff Library, and a student microcomputer cluster. The two libraries are separated by a ravine; the microcomputer cluster is across the street and down a block.

By early summer 1990, a general program plan was developed outlining the project's new goals. Shepley Bulfinch Richardson and Abbott was selected as the architect in July 1990. For about a year, the library conducted user focus groups (mainly faculty). Library staff meetings were also held.

Working with the architect, four building options were generated by March 1992 (an addition to Candler and three variations of a new wing bridging the ravine between Candler and Woodruff). One of the options to link the two libraries via a wing was chosen.

In November 1993, funds were secured to build the wing.

During 1994-1995, the design of the building was fleshed out, tested against the available budget, and revised.

Prior to the site visit, final approvals were secured, and construction crews were moving trailers to the site. It is anticipated that construction of the four-story, 65,000 square-foot addition and renovation of the Woodruff Library will be completed by the summer of 1998. The total size of the Center for Library and Information Resources will be 350,000 square feet (including both new space and renovated space). It will seat 2,200 users. The project will cost \$23 million. Renovation of the Candler Library is contingent upon additional funding.

The Center for Library and Information Resources will include the Library Preservation Office, Government Documents, Periodicals and Microforms, Computing Resource Services, the Center for Business Information, the Beck Center for Electronic Collections and Services, the Faculty Information Technology Center, Information and Consulting Services, Interlibrary Loan, Multimedia Communications, Reference Services, Circulation and Reserves, three electronic classrooms, the library administrative offices, a multipurpose meeting room, and the Schatten Gallery (art gallery). It will also house dissertation, group, and faculty studies as well as general-use seating.

Indiana University-Purdue University Indianapolis (Martha Steele)

The program plan for the University Library of Indiana University-Purdue University Indianapolis was completed in Fall of 1988, and the building was opened in 1994. Several years before the program plan was written, a university task force had recommended a new building, citing the inadequacy of seating and shelving in the existing library. By the time the university president appointed a committee to plan the library, there was support for the idea from all schools in the university and wholehearted support from the students.

One of the most important elements of the program plan was the provision for a state-of-the-art electronic information environment, with the goal of “making the use and application of electronic information an inherent part of teaching and learning.” The architectural firm of Edward Larrabee Barnes was selected for the project. The first design was rejected by the university because it did not provide for the electronic information system that had been specified in the program plan. However, the director of the library at that time, Barbara B. Fischler, eventually came to feel that a good working relationship was established with the design architect.

A key to the success of the project, according to Barbara Fischler, was the involvement of the business leaders of Indianapolis. A committee of community business leaders helped raise \$18 million of the \$32 million building cost. The remainder of the building cost was appropriated by the state legislature, and another \$4 million was appropriated by the university administration for components of the electronic information system.

The library building has five floors with 256,800 assignable square feet. The current shelf capacity is one million volumes, and all levels of the library can support compact shelves to allow for greater capacity. There is seating for 1,740 persons, including forty study rooms assigned to faculty members and forty-two group study rooms. There are 641 individual study spaces. Although there are spaces designed for differing study situations, all study furniture is equipped with connections for both the library's data network and the fiber optic video network. All of the faculty study rooms and group study rooms now have networked workstations. There are 300 computer tables that have or will soon have networked computers. (Workstations have been added in stages in order to stagger replacement costs.) The library's data network offers numerous information and citation databases, Internet access and tools, and word-processing and spreadsheet programs. The video network offers a selection of several cable television channels, provided at a discount by the local cable television service, and access to most of the library's videocassette collection.

The library also has two classrooms equipped with thirty-six networked workstations in each, and another classroom that will eventually contain a smaller number of workstations. There is also an auditorium that seats 100, which has equipment for video and other audiovisual programs.

The IUPUI Center for Teaching and Learning, located in the library, provides faculty with equipment, manuals, training and consultation in designing technological components of their teaching programs. Librarians also have the opportunity to work with faculty in this setting. The most successful liaison has been with the Undergraduate Education Center, which has formed teams that include librarians to help design undergraduate courses.

University of California, San Diego (Judy Myers)

The goal of the 1993 addition to the 1960s library building was to accommodate growth that had already taken place. The existing library was far below state guidelines in reader space and collection space. Also, the library administration was concerned that electronic services take more space than print-based services to serve the same number of users. Planning began in 1989 and the new wing opened in March 1993.

The addition nearly doubled the size of the building to over 250,000 square feet. (There are several other libraries on campus, including an undergraduate library.) The main library building houses just over 50% of the campus library holdings, and has a capacity of 1.5 million volumes. The expansion added 2,200 reader stations (on a campus with nearly 18,000 students). Much of the added space was needed for an expansion of services, particularly electronic services.

The planning process was comparatively straightforward. California is very programmatic in building decisions, and the library was nearly 50% below state guidelines for volume capacity and reader spaces. A major focus of the local planning process was the library's interest in moving the Science and Engineering branch library into the expanded building. Also, the existing library had a very distinctive shape, which was seen as an emblem for the campus. The architect presented two plans. The selected plan provided for the entire expansion to be underground, in order to preserve the shape of the original building.

All of the library's services and staff were moved into new or remodeled space. The Information Desk and the Circulation and Interlibrary Loan counter are immediately inside the door. Wide vistas lead to the Social Sciences/Humanities Library and the Science and Engineering Library. Two other branch libraries and Special Collections are downstairs; the stairways are wide, open, and prominently located. The 10-foot-high ceilings permit effective use of ceiling-mounted signs. Roll-down chain mesh gates are used to secure parts of the building so that special events may be held in a lobby area when the building is closed, and so that branch libraries may close while the building is open.

The new space has a great deal of infrastructure support, such as a waffle-slab floor on the top floor which permits network and electrical wiring to be available within a few inches of any part of the floor. Initial data cable contained sixteen twisted-pair plus four fiber optic cables. The air conditioning system conditions and dehumidifies outside air, mixes it with returned air, and conditions and dehumidifies it again. Temperature is maintained reliably at 68-72 degrees, humidity at 50%. Special Collections has an additional system that is activated if the central system cannot maintain the more stringent conditions required for that collection. Much of the floor in the addition was designed to accommodate compact shelving or microfiche cabinets. This upgrade is quite inexpensive during construction.

The library addition has a great deal of natural light from window walls that open onto a ravine that runs through both wings of the new construction. There are large light wells with shrubs and trees on the underground side.

University of Oregon (Pat Bozeman)

The Knight Library, University of Oregon, prior to the recent addition and renovation, consisted of the original 1937 building and two additional expansions dating from 1950 and 1966, totaling 237,000 square feet. The library serves a student body of 16,500.

The need for library expansion and renovation was studied by two campus committees, 1978-79 and 1986-87, and was documented for eight years before funding became available (in 1987) for the building project. Fund-raising strategies were begun by the library director in 1980. In 1987, a nineteen-member User Group of faculty, students and staff was appointed; two independent consultants also were hired. A resulting feasibility study examined the existing situation.

Collections had grown by more than 40% and seating had been largely displaced by shelving for materials, consisting of a print collection numbering two million volumes, as well as an additional 40,000 rare books and 13,000 linear feet of manuscripts. The university's enrollment had increased by a similar percentage margin, causing added pressure for library seating which, when construction began, was at 600 seats. New electronic technologies demanded more flexibility in the data cabling system than existed, and environmental systems, including lighting, heating, ventilation, and air conditioning, were inadequate for preservation of materials and for patron comfort.

The User Group also identified building project goals: (a) to increase space for growing collections, as well as to bring together components of collections which, over time, had become physically separated due to increased numbers of materials and resulting space constraints; (b) to provide improved environmental controls; (c) to increase seating capacity for patrons; (d) to create an upgraded structure to accommodate current and future electronic technology; (e) to augment instructional components, including an instructional technology center, focusing on distance learning, and to create a new classroom; (f) to improve departmental adjacencies, especially among public service units; and (g) to improve workflow among and within public and technical services units.

The library addition (1991-92) and renovation (1993-94) have resulted in adding 105,700 square feet of space, including the new building, or South Lawn Addition (with a structural capacity for three additional floors, at a total of 60,000 square feet.), housing many of the public service units and study areas; a Rooftop Addition to the 1966 building (containing reading and study areas and collection growth space); and the Kincaid Addition (housing the new Instructional Media Center, some technical services units, and a loading dock and shipping/receiving areas). The building now has the capacity to seat more than 2,000. In both new and renovated space, the heating, ventilation, and air conditioning (HVAC) system has been engineered to maintain stable and comfortable room temperature and relative humidity levels. In Special Collections, stand-alone systems provide optimum temperature and relative humidity levels for various types of materials. All new windows are energy-efficient (thermopane-type) with ultraviolet filtering, giving thermal protection, inhibiting deterioration and fading of library materials, and cutting glare.

University of Southern California (Linda Thompson)

The Thomas & Dorothy Leavey Library opened at the beginning of the 1994 fall semester. However, the planning for Leavey Library began approximately eight years ago following a re-accreditation of USC. The library self-study done as part of the re-accreditation process came to the following conclusions: 1. a facility for undergraduates was needed, 2. more shelving for books was needed, and 3. more reader seats were needed. Leavey Library primarily addresses items 1 and 3.

Although it does include room for a modest print collection of approximately 120,000 volumes, Leavey is only one of more than twenty libraries on the USC campus; therefore, it is not required to house the majority of the university libraries' holdings. Additionally, there was a strong desire to build a facility that could take full advantage of electronic

technology, and Leavey Library was designed with this goal in mind.

Concurrent with the planning for Leavey, USC also began a capital campaign with a goal of \$550 million. During this campaign, \$55 million was raised for the library. Of this amount, \$28 million was dedicated to building Leavey, and the remaining \$27 million was used for other library improvements.

The architect for the project was Shepley Bulfinch Richardson & Abbott. The library staff found working with Shepley Bullfinch to be a positive experience. The firm came to the project without any preconceived ideas about the facility, and it was open to the suggestions and priorities of the library staff.

One of the most important features of the library is the Information Commons, which contains approximately 100 workstations (there are 160 public workstations in the building). The perimeter of this area is lined with small group study rooms each containing a workstation. All of the workstations are connected to the campus network that provides access to a wide variety of resources including library catalogs, citation databases, full-text journals, Internet resources and tools, and various software packages (e.g., word processing, spreadsheet, and desktop publishing).

Leavey also has two electronic classrooms and a small auditorium. One classroom has fifteen workstations and the other has twenty-five. The auditorium has Mac, PC, and media capabilities. It has fifty built-in auditorium-style seats, and an additional twenty seats at the back. These facilities are used by library staff to present numerous courses to the USC community. These courses cover a variety of topics that address the creative and effective uses of technology to enhance research and teaching activities.

The library is a heavily used facility: it has been visited by more than one million users in each of its two years of operation. Leavey is known on campus as the "teaching library," and it is the nexus where students, faculty, technology, ideas, and learning come together.

The University of Washington (Pat Bozeman)

The Suzzallo Library, University of Washington, prior to the recent addition, consisted of the original 1926 building and two additional expansions dating from 1935 and 1963, totaling 310,000 square feet. The library serves a student body of 34,000.

The need for library expansion and renovation was widely recognized in the mid-1970s. A study completed in 1978 projected library facilities needs through 1986. Design funds were approved for the 1979-81 biennium for an auxiliary stacks and service facility for up to 1.1 million volumes, as well as space for Manuscripts and University Archives and for Acquisitions. Renovation was to be part of the long-range solution to space problems. In the interim, additional user seats were removed to install needed shelving.

An early 1980s recession and resulting state budgetary problems postponed any new campus construction.

Another library space study was completed in 1984, projecting facilities needs to 2010. It concluded that, due to funding delays, construction of an auxiliary stacks building would no longer meet projected space needs. With shelving approximately 85% full, the library arranged for compact storage in another campus building and additional off-campus space was leased. This study was the product of an ad hoc planning committee, consisting of faculty, staff, and two librarians. They proposed several possible solutions to the library's space problems, among which was the construction of a new, adjoining building, to be

followed by renovation of the existing facility. In 1985, the state legislature authorized design funds for the addition, followed by funding approval for construction in 1988, the year in which ground was broken for the Allen Library. The library's print collection numbers 5.3 million volumes. This includes 100,000 rare books and an additional 50,000 linear feet of manuscripts and archives. By this time, shelving had exceeded 98% capacity, creating severe crowding of collections, as well as resulting crowding of users and staff in the Suzzallo Library.

The following were identified as goals for the library building project: (a) to provide additional collection space with improved environmental controls; (b) to consolidate special collections stacks in one geographical area and to bring university archives into close proximity to special collections; (c) to increase user seating and study areas; (d) to create an upgraded structure to accommodate current and future electronic technology; (e) to make public service units more patron-accessible; (f) to bring library departmental units into an improved organizational structure with logical adjacencies and better workflow; and (g) to meet current, augmented structural and seismic codes in the Phase Two renovation of Suzzallo Library.

The new Allen Library was constructed between 1988-90, adding 215,000 square feet to the existing central library facility. Consisting of North and South Wings (five and four stories, respectively, each with two basements), it houses the Natural Sciences Library, Special Collections and Preservation, Manuscripts and University Archives, and Library Administration. The Allen Library provides additional, environmentally controlled space for book and periodical collections and user seating and has a capacity for over one million volumes. It adds 500 study carrels and 80 graduate study spaces. The building is cabled for current and future electronics technology, and all study desks are wired for computer hook-up. Lighting is filtered against ultraviolet rays, and windows are constructed of energy-saving, insulating glass with a tint for sun and ultraviolet control.

The second building phase, yet to be realized, consists of the complete renovation of the Suzzallo Library. To be addressed in Phase Two will be moving technical processing units away from public services areas, making public areas more accessible to patrons, upgrading electronic technology and wiring the building to support that technology, and bringing the building and its two later additions up to current structural, seismic, and fire codes.

Appendix B. M. D. Anderson Library Facts

The M. D. Anderson Library consists of a 1952 building and two additions. The first addition was completed in 1967; the second was completed in 1977. When the 1977 addition was designed, a complementary South Wing was also designed. The South Wing was scheduled for completion in 1985.

Library functions occupy approximately 220,000 square feet of the total 250,000 assignable square feet in the building.