

WHITE PAPER

# RUNNING OUT OF ROOM

Growing array of on- and off-site storage solutions help academic libraries adapt to increasingly diverse user needs, effectively manage continued growth of collections.



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## EXECUTIVE SUMMARY

The role of the campus library is changing, and that change is affecting both the services offered to students and faculty and the space available for collections.

Libraries are no longer simply places for research, browsing, studying, and quiet contemplation. To accommodate academic requirements, students' rising expectations and changing information formats, libraries have added spaces such as video viewing rooms, language labs, writing and tutoring centers, meeting rooms and cafes.

While all this happens, acquisition rates remain steady, and collections continue to grow. The result is that libraries are running out of room for traditional stacks. Efforts to reduce collections by weeding and digitizing have had limited success, and are not feasible or desirable for many institutions. Adding space to the library – even if funds are available – is often impossible because the buildings are often located at the center of campus. The result: Libraries must find creative ways to store collections at a reasonable cost, without compromising service.

A common approach to the situation is to build storage space specifically for materials that are requested infrequently. Other approaches include installing high-density mobile shelving or automated storage and retrieval systems within the library, or building/leasing large-scale, climate-controlled repositories off-site. Storage options in these facilities include fixed shelving systems, mezzanines or Static High-Bay Storage systems. Another option includes an emerging concept that involves compact movable shelving systems (Mobile High-Bay Storage). The latter substantially reduces the space required for storage and hence the size of the building. That in turn reduces construction costs and substantially reduces the cost of heating, cooling and lighting (lifecycle costs) for as long as the building stands.

In short, space-starved libraries must strike a balance between the need for more room for people and collections and the need to maintain a high level of service. Equally important is the goal to meet overarching objectives of the institution, such as the desire for green buildings and holding down costs. Without question, the issues are complex. Ironically, education is the key. Toward that end, decision-makers will do well to assess the issues – and gain an understanding for the breadth of solutions used to effectively manage collections.

<sup>i</sup> The State of America's Libraries: A Report from the American Library Association; April 2007.

<sup>ii</sup> Top 10 Assumptions for the Future of Academic and Research Libraries, Association of College and Research Libraries (ACRL); March 2007.

## MANAGING COLLECTIONS: AN ONGOING CHALLENGE

As the world of digital publishing expands, and as Google™ undertakes a massive project to digitize virtually every book in existence, academic libraries still face the challenge of managing growing collections – while shelving and storage space becomes ever more constrained.

Libraries in general continue to grow and gain importance, and academic libraries in particular are becoming critical centers of campus activity. The American Library Association (ALA) reports that library use is up nationwide among all types of library users, continuing a trend that has lasted a decade. Almost 1.8 billion visitors checked out more than 2 billion items in 2006.

Meanwhile, in academic libraries, usage continues to increase despite growth in online resources for study and research. Usage grew from 880 million library visits in 2002, to more than a billion in 2004, an increase of more than 14 percent. Circulation was up 6 percent, to more than 200 million items.<sup>i</sup>

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Acquisitions at these libraries continue unabated. As a consequence, many are running out of room in older buildings hemmed in at the centers of college and university campuses. In response, libraries are

seeking cost-effective ways to create storage space for materials, especially those requested infrequently.

Librarians have many options for storing materials, within the library and off-site. Their challenge is to choose a combination of solutions that most effectively control costs, protect the integrity of valuable material, support high-quality service to library users, and contribute to larger organizational goals, such as sustainable facility design and LEED certification.

## CHANGING ROLE FOR LIBRARIES

There is more at work on libraries' space issues than the sheer size of book and periodical collections. Above all, libraries need to focus on their users, and those users today demand more services than ever.

The number of users are growing as college and university enrollments increase. The U.S. Department of Education National Center for Education Statistics projects that overall enrollments at degree-granting institutions will rise by 15 percent to 20 percent between 2002 and 2014.

Those students, along with faculty members, demand faster and greater access to services. Students increasingly see themselves as customers and consumers, and they expect high-quality facilities and services.<sup>ii</sup>

Meanwhile, the library's role is changing. Thirty years ago, the measure of a library's service to its clients focused on the size of the collections, as judged by the number of volumes and depth of coverage, according to Information Today, Inc.

“A good physical collection, sufficient to meet almost all the immediate needs of campus users and support their long-term needs, is vital.”

“Today, the answers to quality and value questions are broader and relate to a more expansive role for the library,” the report states. “Many academic libraries are in the process of transforming themselves from passive service providers to active and vital forces on campus... (T)oday’s academic library is a vibrant place of change, discovery, learning and experimentation where students, scholars and librarians are thriving.”<sup>iii</sup>

Clearly, campus libraries are no longer simply places for studying, browsing, and quiet contemplation. Users demand other kinds of spaces: meeting rooms for study or discussion; study spaces with tables, electrical outlets and Internet connectivity; spaces for quiet reading; and places to socialize, like cafes.

“Many libraries are home to language labs, writing centers, and tutoring centers...” according to a report from the Council on Library Information Resources (CLIR). “Furthermore, as faculty members revise courses to include electronic resources, students want enhanced space with group video-viewing rooms, discussion areas, and ready access to computers.”<sup>iv</sup> Other factors that affect library space and services include:

- Growth in enrollment of older, non-traditional students.
- A trend toward libraries being open and staffed around the clock.
- Opening of facilities to the community to help share costs.
- The realization that sharing with the community expands the patron base and diversity of needed resources.

Beyond all this, in a highly competitive marketplace, the quality of physical environments – including the library – affects the institution’s ability to attract students.

“Academic libraries need to combine three different aspects: collection, place, and service,” says Walt Crawford of Research Libraries Group in Mountain View, Calif. “A good physical collection, sufficient to meet almost all the immediate needs of campus users and support their long-term needs, is vital.”

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“Academic libraries are also places: places where students can study, places where new scholars browse the journals in their area to gain breadth and depth, places where librarians can offer personal reference service. As such, academic libraries also tend to be statements: the quality, size and placement of a campus central library says much about the institution,” concludes Crawford.<sup>v</sup>

## TIGHT SPACE, TIGHT BUDGETS

All these demands on space inevitably constrain the room available for collections. Ideally, libraries would like to expand the buildings. In practice, that is difficult. The library must compete with every other campus facility and department for severely limited funds. Even if money is available, space to build often is not.

“On most college campuses, the library is not the first building that was built, but it is probably the third or fourth,” observes Michael Cohen, an architect and

library specialist with Elkus Manfredi Architects in Boston, Mass.

"In general, those libraries are in the center of the campus, where there is not a great deal of room to grow."

One seemingly obvious way to deal with collection space is to weed. Another is to digitize. In practice, neither has shown much promise, and either solution is at best temporary. Predictions that the digital world would reduce the volume of print have not come true. "There is more material in print now than ever before," Cohen says. "College library acquisition rates are still as high as they have ever been, and most collections are growing at the same rate they always have."

In any case, experience shows that weeding and digitizing do not reduce collections significantly. Faculty members and librarians alike tend to resist large-scale weeding. St. Xavier University in Chicago, which faced a severe space shortage, found systematic weeding to be fraught with political problems.

"A successful weeding program requires very careful – and very time-consuming – cultivation of the administration and faculty," observes Mark A. Vargas, Director of the University's Bryne Memorial

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Library. "The sheer size of the stack space problem meant that a successful weeding program needed to be on a scale so much larger than ever attempted that the political fallout was not worth the effort."<sup>vi</sup>

In 2003, Swarthmore College librarians identified books in philosophy and religion as candidates for weeding under a set of strict criteria. Preliminary response suggested that the faculty would support weeding of about 35 percent of the items in philosophy that met the criteria, and fewer than 10 percent of the items in religion.<sup>vii</sup>

<sup>iii</sup> Academic libraries are alive and thriving: Interviews with four academic library directors, Drake, Miriam; Information Today, Inc.; ©2007.

<sup>iv</sup> Library Buildings and the Building of a Collaborative Research Collection at the Tri-College Library Consortium: Report to the Andrew W. Mellon Foundation, Luther J, Bills L, McColl A, Medeiros N, Morrison A, Pumroy E, Seiden P; April 2003.

<sup>v</sup> Library Space: The Next Frontier? Crawford, Walt; Online; March 1999 V23 i2 p61(1).

<sup>vi</sup> Using a Third-Party Vendor for Off-Site Storage of Library Materials, Library Administration & Management, Vargas, Mark A.; Winter 2005.

<sup>vii</sup> Library Buildings and the Building of a Collaborative Research Collection at the Tri-College Library Consortium: Report to the Andrew W. Mellon Foundation, Luther J, Bills L, McColl A, Medeiros N, Morrison A, Pumroy E, Seiden P; April 2003.

Another force against weeding is a reaction to students' reliance on the Internet for research, Cohen observes. "When a student looks for a topic, a Google search brings up a list of items, and the first three are magazine articles that are not first-source material," he says. "The reaction – some would argue that it's an overreaction – is for faculty to insist that students do research with first-source material. When that happens, the library's ability to weed material is lessened."

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Digitization has helped free up library shelves, but not nearly enough to relieve the space problem. The availability of journals in electronic form has created opportunities for space savings. In 2002, the Swarthmore Science Library cancelled 48 print journals in favor of online versions. That reduced the requirement for shelving new volumes by 340 linear feet in the following year.<sup>viii</sup>

Saint Xavier University replaced 50 journals with their online version, "but this saved only about eight shelves per year, or enough room to hold approximately 200 volumes. A number of reference print sources were also cancelled in favor of the electronic versions, but the existing overcrowding in the reference collection was so extensive that little room was saved."<sup>ix</sup>

The digitizing of books has been less effective. Whereas physical volumes allow readers to thumb through and locate material quickly by using the table of contents and index, digitized books typically are not searchable, and therefore are cumbersome to use. The CLIR report states, "Currently the e-book shows its greatest potential in the areas of reference and reserve readings. It has not developed its full potential as a substitute for a print stack title that can be read in the traditional manner."<sup>x</sup>

<sup>viii</sup> Ibid.

<sup>ix</sup> Using a Third-Party Vendor for Off-Site Storage of Library Materials, Library Administration & Management, Vargas, Mark A.; Winter 2005.

<sup>x</sup> Library Buildings and the Building of a Collaborative Research Collection at the Tri-College Library Consortium: Report to the Andrew W. Mellon Foundation, Luther J, Bills L, McColl A, Medeiros N, Morrison A, Pumroy E, Seiden P; April 2003.

## EXPLORING STORAGE SOLUTIONS

If the collections must stay, and if there is no way to add space, then there are two basic choices: Fit the books into a smaller space within the library, or move some of them elsewhere. Many libraries have already exercised the first option by installing High-Density Mobile Storage (HDMS) systems, which can double the storage capacity of a given space when compared with conventional fixed shelving.

In this configuration, also known as Compact Storage, shelving is mounted on wheeled carriages that run on tracks. Individual carriages compact together, eliminating the need for multiple aisles and substantially reducing the space required. A user moves the carriages to open the aisle in which a desired item resides, either by using a crank mechanism (mechanical assist) or, more commonly, by pushing buttons to activate powered units with redundant in-aisle safety devices (powered). In fact, library consultants have found that as much as 50 to 90 percent of an active collection can be housed on this proven storage solution. An important consideration with any HDMS system is that it cannot exceed the structured load requirement of the floor where the system is located.

As new services demand more space, and as collections continue to grow, even compact storage may not entirely solve the space problem. The next alternative then is to build special storage for seldom-requested materials (secondary and tertiary collections) that do not need to be in the stacks library users browse. Ideally, this storage is built within the library so staff can retrieve material upon request and deliver it to users within a few minutes. There are two basic on-site storage schemes.

**Static High-Bay Storage (SHBS).** In this solution, materials are placed on fixed shelving units up to 15 feet (4.5 meters) high in a dense configuration. Items are arranged by call number. The solution applies to on-site library space, as well as off-site facilities.

"Many older libraries have high ceilings on their main floors," Cohen observes. "By building a small storage facility, they can clear out a substantial amount of space elsewhere in the building."

### **Automated storage and retrieval systems (ASRS).**

Some libraries have adapted technology used for order-picking in large industrial and distribution warehouses. ASRS is a computerized system that robotically retrieves material orders. Items are stored in bins on specially designed shelving. Upon receiving a request for an item, a librarian at a workstation enters its identity to the computer, which directs a robotic arm to retrieve the bin in which the item is stored. The arm delivers the bin to the workstation, the librarian takes the item out, and the system returns the bin to its assigned location.

ASRS have space-saving benefits, and the systems pick requested items with reasonable speed. At

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Chicago State University, for example, students order items from the ASRS by logging onto the library web site. The system takes about three minutes from the time the order is placed, until the book is delivered

to the circulation desk for pickup.<sup>xi</sup> On a cost per-square-foot basis, computerized ASRS are well suited for high-pick operations, such as those found in the retail sector, but can be cost prohibitive for some academic libraries.

## MOVING OFF-SITE

When adequate space or structural capacity cannot be created in the building, libraries move low-use material to warehouses off-campus. To minimize the footprint, and thus the cost of land, the facilities are built tall. The interior is filled with books on shelving, typically 30 to 45 (9 to 14 meters) feet high. Here, items are arranged by size, versus call numbers, to maximize density. To retrieve items, staff members use high-reach lift trucks.

Pioneered by Harvard University in the mid-1980s, SHBS apply commercial warehousing principles to library space and preservation issues. Environmental controls ensure preservation of books and film while conserving space on campus for heavily used collections and services.<sup>xii</sup>

These facilities have substantial construction costs, as well as long-term costs for staffing, security, climate control, heating, cooling and lighting. Therefore, libraries at institutions in a common geographic area often form consortia to share a facility and its expenses – and sometimes its contents.

One such consortium is the Orbis Cascade Alliance, serving 33 member institutions in Oregon and Washington with 207,000 full-time equivalent students. This private and public collaboration stores 8.8 million

titles. In 2006, 335,789 books, CDs, DVDs and other items were borrowed by students, faculty and staff – an increase of 67 percent over the total before the alliance was formed. Requested items are delivered in 24 to 48 hours.

Another collaborative arrangement is the Preservation and Access Service Center for Colorado Academic

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Libraries (PASCAL), operated jointly by the University of Colorado at Boulder, the University of Colorado at Denver, the University of Colorado Health Sciences Center, and the University of Denver.

“By the mid-1990s, all four libraries needed additional space, and all four were located in the Denver metropolitan area,” reported Scott Seaman, associate director for administrative services with the Norlin Library at the University of Colorado at Boulder. “Each library cited examples of how shelving had been added to its buildings, thus eliminating ever-greater amounts of student seating,” Seaman said.

“All four institutions were experiencing the impact of changing classroom teaching practices that necessitated more group and collaborative study spaces in libraries.” None of the libraries had room to expand on campus.

The PASCAL consortium combines low-use materials

from the four institutions into one collection that gives regional users full access through a combined catalog. Items circulate under a single set of loan policies. "An online catalog record for each item informs patrons that the item is stored in a remote location, and items are typically requested by the patron directly through the online catalog. Regular courier deliveries bring requested materials to campus."<sup>xiii</sup>

## MAXIMIZING SPACE

As growing numbers of libraries move low-use materials off-site, a new concept in storage has emerged. Called Mobile High-Bay Storage (MHBS), this alternative to the SHBS approach applies the proven basic principles of compact mobile shelving to these large-scale environments.

Mobile shelving in high-volume, heavy-duty storage is by no means new. It has been used in multiple industries for decades to conserve space while providing fast, ready access to all stored material. Warehouse

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mobile shelving systems have been built with carriages over 100 feet (30 meters) long, up to 45 feet (14 meters) high, and with load capacities exceeding 60,000 pounds (27,000 kilograms) per wheel. The shelving and its long-term structural integrity are thus fully proven.

MHBS systems consist of shelving units typically 30 feet (9 meters) high with 30 or more tiers of shelves. Shelving carriages, which are on mounted rails recessed into the concrete floor, are moved by DC motors. All components are designed to accept the loads from the tall stacks.

To access specific items, staff members press a control head mounted on a stanchion at end of the aisle, or via remote control. The carriages move

<sup>xi</sup> Chicago State's Brave New Library, Huffstutter, P.J.; Los Angeles Times, April 22, 2007.

<sup>xii</sup> High-Density Storage for Libraries, Murray-Rust, Catherine; Orbis Cascade Alliance.

<sup>xiii</sup> Collaborative Collection Management in a High-Density Storage Facility; College & Research Libraries, Seaman, Scott; January 2005.

sequentially to open the selected aisle. Staff members typically retrieve materials using wire-guided, person-aboard narrow-aisle picker vehicles.

Wire guidance lets operators efficiently and safely negotiate aisles as narrow as 50 inches without having to steer. Safety systems prevent carriage motion if a person or object is in the aisle, and stop the carriage if it contacts a person or object.

Like SHBS, the system is designed to maximize storage density – only to a higher degree. Shelf levels are adjustable in 1-1/64" (26 millimeter) increments. Systems can achieve storage space efficiencies as high as 13 to 15 cubic feet per square foot (3.96 to 4.57 cubic meters per square meter) of floor space – far greater than for static systems.

Shelves are arranged back-to-back on the carriages so that staff members can access any item simply by opening the proper aisle. Books are

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MHBS helps reduce initial and long-term lifecycle costs because it enables a smaller building footprint.

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typically stored in tote boxes (book trays) on 36-inch (914 millimeter) -deep shelves, two deep by five wide typically per shelf. Archival materials are stored in boxes on 30-inch (762 millimeter) -deep shelves.

Systems can be configured to accommodate an institution's desired picking speed. For example, if a single lift truck operator will pick orders, carriages can be arranged in a single bay with one movable aisle. To accommodate greater picking speeds with two or more lift trucks working, carriages can be divided into separate bays with an access aisle for each bay, at a minor sacrifice of space efficiency.

MHBS helps reduce initial and long-term lifecycle costs because it enables a smaller building footprint. That saves on construction costs and on heating, air conditioning and lighting costs for as long as the building stands. Independent studies demonstrate millions of dollars in lifecycle

savings can be achieved for large storage facilities. Reliable engineering models can predict 20-year total facility lifecycle costs based on a complete range of variables: building footprint, building height, wall surface area, local climate, internal conditions desired, local fuel and electricity costs, and others.

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Greater energy efficiency also supports green and sustainability initiatives, and can help support certification under the U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) Program.

An important consideration for a MHBS system is whether it satisfies industry specifications. Given the critical nature of the system, it should be system listed by Underwriters Laboratories. It should also be fire tested, and exceed the most stringent National Archives and Records Administration's fire safety standards for archival record storage. Additionally, it's important that the system meets, or exceeds, powder-coat paint specifications set forth by the American Library Association, as published in their Library Technology Reports.

## EVALUATING ALTERNATIVES

Whether on-site or off-site, a sound storage strategy, combined with judicious weeding and digitizing, can help academic libraries provide space for diverse services while sustaining expeditious access to collections.

A full range of equipment and configurations is now available for on-site and off-site storage. An intelligent solution maximizes space efficiency, holds down building and operating costs, protects the integrity of stored materials, and supports the overriding goal of delivering high-quality service to patrons.

Given the complexity of storage issues and the expanding array of choices, colleges and universities seeking expert assistance should call upon a commercial storage company with extensive experience in designing, installing, and servicing systems designed specifically for academic libraries. Such experts are exposed regularly to real-world challenges, and are able to guide decision-makers toward solutions that align with the institution's overriding goals.

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## ABOUT THE AUTHOR

Mark Haubenschild has been Vice President of Sales for Spacesaver Corporation since 2003. He's been with the company since 1982, starting on the ground floor and moving up through the ranks with progressively responsible positions, including production, applications engineering, production planning, installation, project management, sales and distribution support. In addition, Haubenschild served as Team Leader for the Archives II project in College Park, Maryland (the largest powered High-Density Mobile System in North America).

He is currently Spacesaver's Acting Library/Education and Museum Market Manager (1999-present), a Major Projects Team Leader for all projects (1990-present), and a member of the Executive Management Team (1998-present). Haubenschild holds a bachelor's degree in Business Administration from the University of Wisconsin – Whitewater. He is an active member of American Library Association (ALA), American Association of Museums (AAM), and National Fire Protection Association (NFPA).