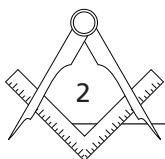


Building with Purpose

A Quantitative Overview and Analysis of New
U.S. Academic Library Construction, 2000–2014

An ACRL Occasional Report



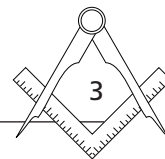


In recent years, the purpose of the academic library physical space has been the subject of much debate within the library profession and, more broadly, higher education as a whole. While some would argue that the academic library building has been unfairly characterized as a legacy structure, inflexible in its primary role as a space for physical materials, others point to the ongoing transformation of the library space as a center for collaboration, multi-modal learning, discovery, and social and cultural life. Much of what we have learned about new and, by most accounts, successful library renovation and/or building projects over the past several years comes by way of case studies and assessment surveys. As the conversation about the evolving role of the library space widens, a broad, quantitative overview and analysis of new library construction and/or renovation activity across U.S. higher education is useful in helping us understand pace and scope of investments in new library space across different types of institutions. This study offers such an overview by presenting quantitative data on new U.S. academic library building between 2000 and 2014. This analysis examines new library construction through a framework of institutional characteristics, which provides an opportunity to identify patterns in terms of where we are investing in new library space. This information also provides evidence of shifting institutional intentions and aspirations for the library building.

Purpose of the Study

The general purpose of this study is to investigate new U.S. academic library building construction between 2000 through 2014. This exploration is the first of a two-part analysis. This paper comprises the first segment of the analysis, and seeks to identify trends and patterns in academic library construction in the post-2000 era. The process begins with developing an inventory of new library building projects across this 15-year period. This first step provides not only a baseline for analysis in the form of a study population, it also addresses one of the primary, albeit basic, research questions about the overall level new academic library construction activity in the new century.

Focusing on library's completed after 2000 provides a useful demarcation for a range of reasons. First, previous studies (Bennett, 2003; Shill & Tonner, 2003) have explored design, planning, and usage themes in new and renovated libraries completed in the 1990s and first few years of the 2000s. Often, even buildings completed (or renovated) as recently as the 1990s have been informed by library planning and design considerations that were little changed in the second half of the 20th Century. Planning considerations continued to be heavily influenced by growth in print collections and expansion of operational units (Bennett, 2003). Based on design themes common in library's completed in recent years, as well as more recent research (Stewart, 2010), we can draw certain assumptions about new academic library buildings completed in the new century. For example, print material and growth of physical collections, while still important, are no longer the leading planning factors for new library space (Stewart, 2010).

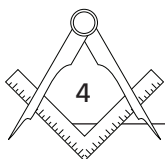


Library design is changing rapidly in the current era. New buildings represent an institution's confidence in the evolving role of the library physical space. New library construction, unlike renovations, provides library planners and designers with the opportunity to incorporate building elements that express the most current thinking in library design. It is true, of course, that library renovation projects frequently reflect innovative dynamic designs. There are numerous examples to choose from, including projects such as the \$109 million dollar renovation of the Thompson Memorial Library at Ohio State University (Pyle, 2009). Renovation activity also far outpaces new library construction. However, working with existing library space—particularly the book bunker structures so common in mid-20th century academic library design—often poses challenges that preclude design opportunities available in the planning of a new building.

It is for the reasons described above that this study focuses on new academic library buildings only. Renovation activity will be explored in a later study.

This study utilizes key institutional attributes, derived mainly from The Carnegie Classification of Institutions of Higher Education, to describe institutional characteristics of colleges, universities, and special-focus institutions that completed new academic library buildings between 2000 and 2014. Applying these variables supports one of the main goals of the study—to identify trends and patterns in terms of the types of institutions that are investing in new library buildings. These attributes, while not exhaustive, frame new library construction through the lens of taxonomies of institutional categorization and description. Providing this type of analysis of academic library building activity will be useful to a number of groups and individuals. For library leaders, these data provide a starting point for assessing the climate in U.S. higher education in terms of overall new library construction activity, as well the institutional environments in which new building activity is more (or less) likely to occur in recent years. For academic and administrative leaders, having data that delineates institutional characteristics such as enrollment profile for institutions that build new libraries provides a starting point for peer analysis and understanding justifications presented in support of a new (or remodeled) library facility. For library designers, data from this study provide a broad, quantitative view of building activity and may help in identifying segments in U.S. higher education for specific focus and study. For researchers of library space planning, design, and construction, these data provide an aggregation of information on building activity in the new century, and augment by several years data collected in earlier studies (Stewart, 2010; Shill & Tonner, 2003).

Across U.S. higher education, there is no shortage of opinion about the future of the academic library building. This first part of this two-part study does not seek to directly address these questions. It does, however, provide quantitative data and analysis that can play an important informational role in broader discussions about this future and the libraries we still hope to build.



Questions for Research

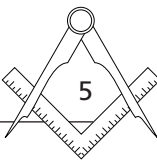
The four primary areas of inquiry in this study are:

1. What is the pace of construction of new academic library buildings in U.S. higher education since 2000?
2. What is the purpose, as defined by general categories of function, of each these new library buildings?
3. What are some of the key institutional attributes of colleges and universities completing new academic library buildings, and how are these types of institutions represented in the study population?
4. How does the percentage of different types of institutions completing new academic library buildings in the study population approximate to the percentage of these types of institutions in the U.S. higher education population?

The above questions present numerous opportunities for sub-questions around areas such as trends in library construction over the past fifteen years. These questions will be integrated into the discussion of results. Selection of institutional attributes for use as a framework for analysis will be discussed in the methods section of this study, as well strategies for identifying new library projects for inclusion in the study.

Methods

There were several steps involved in data selection, collection and presentation for this study. The first step was, of course, searching for, identifying, and verifying new academic library building projects completed between 2000 and 2014. Creating this inventory was a time consuming, often complex task that involved using myriad sources. Annual architecture reports in two major professional publications, *Library Journal* and *American Libraries* were consulted. The *Library Journal* report, “Year in Architecture,” published each December, is the more comprehensive of the two. Both sources delineate by project (e.g., new facility versus renovation) and library type. Reports from these two sources were searched from 2000 through 2014. Other resources consulted included the *Chronicle of Higher Education’s* Buildings and Grounds archives, which runs back to 2007. For this study library additions are included as new buildings if they approximate or exceed the square footage of the building being expanded (smaller additions will be included in a follow-up study of renovation and additions). Another resource consulted was schooldesigns.com, which provides detailed information on building and renovation projects for multiple types of libraries going as far back as the 1990s. Targeted queries were also performed using Internet search engines. Often, information on a project was discovered via one source, and verified and/or expanded via other sources such



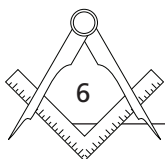
as architecture firm websites, press releases, news articles, and institutional websites. Finally, an inventory of new academic library building completed between 2003 and 2009, created as part of an earlier study (Stewart, 2010) was included. That study, however, did not include two-year institutions.

The result is an inventory of 232 new academic library facilities projects completed between 2000 and 2014. Institutions completing new academic library buildings in this period range from tribal colleges to doctoral research universities. A number of data were collected for each project: institution name, library name, year completed, project cost, square footage, cost per square foot, architect(s), and library function (derived). Also added were a number of Carnegie Classifications, discussed later in this section. The inventory of 232 institutions is comprehensive, though not necessarily exhaustive. There are likely a small number of projects that are beyond the search strategies employed for this study. However, I believe that this inventory represents a near total picture academic library building projects completed between 2000 and 2014. At the very least, it provides for a robust sub-population and/or sample (n) that allows for one to make reasonable inferences about new academic library construction across the population of institutions in U.S. higher education.

The total number of public and private, not-for-profit U.S. institutions of higher education constitute the parent population for this study. Institutions that completed new academic library buildings constitute the sub-population. As no for-profit institutions reported completing new, stand-alone academic library buildings between 2000 and 2014, for-profit institutions (there are in excess of 1,000 in U.S. higher education) were excluded from the study. Data derived from the Carnegie Classification of Institutions of Higher Education indicate that there are 3,418 public and private, not-for-profit institutions of higher education in the United States and its territories. This population includes all types of institutions, ranging from community colleges to biblical seminaries. In addition to the primary sub-population of institutions that completed new library buildings, further sub-populations of the parent population were also derived as needed for the analysis. An example of a further sub-population is the total number of public institutions with a categorized (e.g., high, or majority) undergraduate student population, or the total number of private, not-for profit, exclusively four-year, undergraduate institutions.

In addition to the institutional and project characteristics discussed earlier in this section, a number of Carnegie Classification descriptors were derived for each institution in the study. These include Basic Classification, Control, Enrollment Profile, and Size and Setting (Carnegie Classifications | Standard Listings, n.d.). These attributes and their sub-categories will be defined and discussed as part of the presentation and discussion of results later in this paper.

Approximation based on type of institution is a technique used frequently in this analysis. With a sub-population of 232 institutions and a parent population of 3,418 institutions, it is



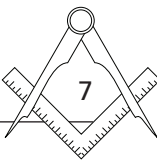
possible to calculate representation of institutions in the sub-population versus their numbers/percentages in the general population. This technique is used as an exploratory tool to show how (or not) academic library construction at institutions with specific characteristics may (or may not) have occurred at higher (or lower) rates than those institutions are represented in the population. This type of approximation allows us to identify patterns in the level of building activity through the lens of institutional characteristics.

Initial data were entered into a Microsoft Excel spreadsheet. Once basic information such as institution, project year, cost, and size were derived, the data were exported to an SPSS data editor. Within SPSS, a range of institutional variables were added, including Carnegie descriptors, which were coded numerically for the purposes of statistical analysis. Tools of basic descriptive statistical analysis, including frequency distributions and cross-tabulations, were performed. The SPSS database also includes an inventory of renovation and additions projects for the same time period. This dataset, which already contains several hundred projects, is still being developed and will be explored in a later study.

Overview of Selected Research and Commentary on Academic Library Design and Construction

Over the past decade, as the discussion in the future of the academic library building has broadened, a growing body of research and commentary has emerged. Some of this research (Stewart, 2010) includes comprehensive literature reviews on academic library planning and design. The purpose of this review is to provide an overview of some of the key research and commentary on academic library design in recent years. While this review is not intended to be comprehensive, much of the material described here, like the above-mentioned work, includes in-depth reviews of the literature. Readers interested in more lengthy overviews are encouraged to explore these articles, essays, and book chapters.

As this is a study of academic library construction, three major studies completed over the past fifteen years will be described. In addition, case studies and other types of material describing selected new building projects will be discussed. Before that discussion, however, it is useful to explore the work of scholars and scholar practitioners who define and describe broad themes in current academic library design—how we think about academic library buildings in the digital age. To that end, this exploration will cover, roughly, general themes as expressed in position papers, essays, book chapters, reports, presentations, and other material. Some specific themes, including sustainability, assessment, learning space, and graduate and faculty spaces will also be discussed. Results of the three studies discussed in this review provide context for some of the general themes explored at the onset of the review.

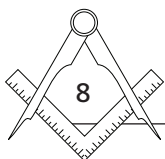


General Themes

The psychological impact and importance of the academic library space and its expression in library design is a theme explored in depth by Demas (2005). Demas argues effectively for a kind of sanctuary in the library space. The library is both a public and private space. As such, it provides the user with a sense of community and a freedom for contemplation. Frischer (2005), a humanities scholar, emphasizes the transcendent, third place nature of the academic library as a place where people come to experience the “drama of community” (p. 50). Freeman (2005) further stresses the role of the academic library as a place where community is created in a world marked by the increasingly isolating effect of the Internet. Demas agrees, and extends the expression of togetherness in the library space as form of participation in the “life of a learning community” (p. 25). Demas adds that the library is one of the few (if only) places on campus where students can enjoy the pleasure of being alone in a crowd without the risk of being socially stigmatized. The library plays a key role in providing a space for students and others to be along together.

Other researchers and commentators have addressed the placemaking theme in academic library buildings in describing both the traditional and evolving role of the building. Jackson and Hahn (2011), for example, using research methodology from the psychology of religion, explored how students, via how they experience the academic library physical space, make psycho-emotional connections to the mission of the broader community of higher education. They found that students overwhelmingly prefer traditional library spaces and are more likely to visit and use materials in these spaces. It should be added, however, that the preference for traditional spaces did not come at the expense of technology. Respondents expressed the desire to have state-of-the-art technology within these traditional spaces. Demas and Scherer (2002) argue for the importance of “*esprit de place*” (p. 65) in libraries: designing spaces that are more than their brick and mortar identities. Design elements of libraries that have *esprit de place* reflect the spirit of the community served by the library. Applied elements in the academic library include a range of learning spaces, exhibit space, natural light (an important design theme in most and remodeled academic library buildings) and, in general, a design approach that steers away from architecture that treats buildings as containers. Cunningham and Tabor (2012) use Kent and Myrick’s (2003) framework as a lens to evaluate what students need from the academic library building as access to collections and related services; uses and activities, especially collaborative study; sociability, and comfort and image.

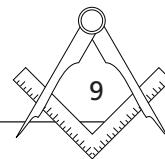
The new or renovated academic library building of the future will be defined by more criteria (Foote, 2004). Design elements send messages through their expression in the finished product. Library design should be informed by our “deep, humanistic” need for thought and reflection. The grand reading room, for example, having been slowly encroached by book stacks over the years, is making a comeback in the academic library building. It is being included in the de-



sign of new buildings and, for existing structures, restored and expanded to accommodate more readers (Foote, 2004). There is little evidence to suggest, in the emerging partial-print era, that new academic library buildings are getting smaller (Stewart, 2010; Boone, 2002). In addition to “grand” spaces, it should also be noted, as one researcher points out, that technology often requires more space than traditional (e.g., low-tech carrels) furniture and shelving (Boone, 2002).

Other researchers and commentators offer broader coverage of topics in academic library design. Weise (2004), for example, discusses changes in library space within the context of ongoing shifts in modes of scholarly communication. She suggests that, as scholarly communication changes, the library as a physical space must adapt to meet changing user needs. She outlines research that shows faculty and student expectations for the library space can be quite different, with faculty favoring electronic access to materials (but with a print archive) and students favoring communal space along with cutting edge digital library services. New academic library spaces will be user-centered, hybrid spaces that provide digital and print access to the scholarly record. They will also be collaborative, communal spaces for learning and learning-related activities. Weise defines the academic library of the future as increasingly place centered, supporting a range of services and activities that are part of the institution’s broader academic mission. Latimer (2011) offers a solid review of the history of the function of the academic library and emerging design themes as the primary focus of the building shifts from physical collections to the idea exchange and knowledge creation. Latimer also posits, as Neal (1996) did nearly two decades ago, that institutions will likely chose to invest in refurbishing existing spaces in the coming years rather than constructing new library buildings.

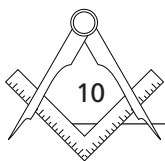
There is much discussion today around the topic of learning space in the library and, certainly, this kind of space is a leading element in library design thinking. There has been a good amount written on the topic of learning space in academic libraries and, as librarians are called upon to articulate links between the library and institutional outcomes, the discussion will likely deepen in the coming years. Lippincott (2013), who has written and presented frequently on the subject of learning spaces, offers a framework for the nature of space that supports the wide spectrum of activities/programming in which the library should be involved. Her “exemplary spaces” include but are not limited to an opening of up special collections with space and programming to engage students at all levels; active learning spaces (e.g., labs); content and media production spaces; makerspaces; and spaces programmed to support student success. All of these spaces can and should be closely aligned with the learning priorities of the parent institution. Years earlier, King discussed the future of the academic library as a learning center driven by the educational goals and culture of the parent institution (2000). Bennett, who has completed a wealth of research on academic library planning, asks those who devise learning spaces (specifically, spaces in which students are responsible for their own learning) to consider how these spaces encourage productive study as well consider the necessary balance of solitary space (2007a).



For the past several years, the student experience—primarily, the undergraduate experience—has been a central focus of discussions on library design. While faculty has certainly not been forgotten, the faculty experience in the library is often measured within the context of collection use. In other words, faculty who need to come to the library to use physical collections will do so. Others, namely in disciplines that no longer rely on printed material for dissemination of scholarship, will simply not come and, subsequently, place little value in the library building. Two studies during the past decade, both by researchers at the University of Oklahoma, explore the issue further. Engel and Antell’s 2004 study asked why faculty spaces are still much in demand in U.S. university research libraries. They found that faculty members who use the spaces place very high value in the quality of the spaces for contemplation and research. A follow-up study in 2006 (Antell & Engel) tested the hypothesis that a faculty member’s age as well as year he/she received his/her terminal degree (“scholarly age”) would affect use of resources in the physical library. Results scholarly research conducted in the library decreases with scholarly age. However, younger faculty members, despite placing less value of print collections, nonetheless placed importance on the library as an important place for scholarship. The researchers concluded that space planners should consider placing more emphasis on user space in the coming years. A report (Brunner, 2013) of a recent study of graduate students at a major, public research university indicated measurable dissatisfaction in the quality of the research library space and, by extension, their ability to effectively work in the space. The study, which was used to inform a renovation project, reminds us that graduate students still want physical library spaces that are devised and programmed for *their* needs.

Purcell (2013) highlights the lack of attention given to staff spaces in the research and literature on space planning. His essay explores trends in academic library staffing and their implications for staff space. Among other things, he points to the continuing trend towards reduction in the ranks of support staff, flexible work schedules for professional staff, and the likelihood, in user-focused spaces, of more “public facing” (p. 138) services that will require spaces that provide for “direct interfaces” (p. 138) between librarians and clients. This is consistent with what we see in many academic libraries: librarians are deployed directly—sometimes “roaming” or at shared open design desks in areas in which they (the librarians) would have in previous years been behind a service desk. Stewart (2013) contends that contemporary library design has focused primarily on innovations related to the user experience. Stewart argues, however, that as academic librarians are increasingly assuming new and more complex roles in the academy, professional staff require more defined, separate spaces for time on task, heads down work. In this way, the academic librarian workspace may be better modeled on faculty office spaces.

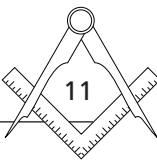
Assessment is an important element in any discussion of new library space. Several writers and researchers are contributing to the discussion. MacWhinnie (2003) examines



the information commons model across multiple institutions and finds a general lack of consistency in how (or if) the effectiveness of the IC is measured. Nitecki (2011) points out that space assessment for academic libraries is a relatively new and changing research area. A more comprehensive research agenda is required, one that, among other things, conceptualizes space assessment within the context of the “needs, behavior, and accomplishments of the inhabitants to learn to create new knowledge with information” (p. 56). Stewart (2011) argues that data libraries already collect about use of services and physical resources can be incorporated into broader assessment of new and existing library learning space. Montgomery’s (2014) pre-and post renovation surveys revealed a wide range of learning behaviors in the college library space, with a user emphasis on social learning. While assessment techniques will not necessarily be the same for new versus existing library space, general principles apply to both, and can be viewed within the larger context of library outcomes. The rapidly evolving assessment movement in the academic library community, exemplified by the Association of College and Research Libraries *Value of Academic Libraries* report (2011), provides frameworks for assessing the role of the building in student outcomes.

Another central theme in new library design and construction is sustainability. While several projects that incorporate sustainability in their design will be discussed later in this review, Edward’s (2011) lengthy essay and comparative case studies provides a solid starting point on the topic. In addition to providing a practical inventory of sustainable design elements ranging from building materials to the availability of public transportation, Edwards discusses the role of sustainable library buildings as “carriers of environmental messages (p. 194). Sustainability, he argues, is changing our notion about the larger purpose of the library space as it “revitalizes library design” (p. 191).

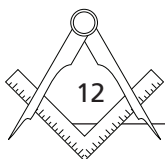
Exploring trends in new academic library construction and design should also include a discussion of academic library closures and consolidations. Often, for example, branch and departmental library closures are connected to new construction (as is the case with Princeton’s Peter B. Lewis Library, opened in 2009) or renovations and/or expansions of existing facilities. Information on closures and consolidations is often found in popular media and trade publications. For example, the 2009 closure and consolidation of the Physics-Astronomy Library at the University of Washington was reported the university’s daily newspaper (Byrnes, 2009). In the 1990s, there were major library closures at consolidations at numerous institutions, including the University of Washington and the University of Michigan (Quigley et al., 2002). Steven Bell (2009) discusses the vulnerability of specialized libraries at research universities, particularly science libraries. As information formats change and the library continues its evolution as an increasingly user-centered space, closures and consolidations of branch and departmental libraries will likely continue in the coming years.



Recent Studies of New Academic Library Buildings

The second section of this review will focus on recent studies of academic library planning and construction. Information on several individual building projects is provided for context. Information of individual projects can be found in a range of resources, including case studies, architectural reports, and news articles. The information on individual building projects is not meant to be comprehensive. These projects illustrate design themes discussed in the first section of the literature review as well as the comprehensive studies.

Stewart's (2010) two part study of new academic library buildings covers 99 projects at U.S., not-for-profit, four-year and above (community colleges were not included) institutions completed between 2003 and 2009. Across that time period, the average cost to complete a new library building was 25 million dollars, with an average per-student cost of approximately \$7,000. There was a clear, downward trend in new building construction compared to the previous seven-year period. Public institutions built larger and less expensive facilities on a cost-per-student basis, while private institutions (which were mainly residential campuses) built more square feet per student. Whether private or public, institutions with predominately undergraduate student populations spent more per student on new library building than institutions in other enrollment profiles. The second part of the study included a 53 question survey sent to library directors at each institution in these institutions. Fifty-eight institutions responded. Findings indicated that the library buildings being replaced with a new library were seldom torn down, but re-purposed for a range of non-library purposes. In addition, new library buildings are almost always larger than the buildings they replace, with significantly more seating capacity and types of furnishings. The strongest planning factors for new library buildings included the changing nature of the needs of the student body, rather than accommodating growth of physical collections, which was a finding in an earlier study of buildings completed between 1991 and 2001 (Bennett, 2003). While the higher the undergraduate student population, the higher the percentage of materials in open stacks in new libraries, nearly two-thirds of the respondents reported declining print acquisition levels. Print acquisition levels are declining most rapidly at institutions with large enrollments (typically, large doctoral research universities). Characteristics of new academic library buildings included multi-use, with the most common non-library facilities being classrooms, computer labs, and cafes. In addition, dedicated faculty space is becoming less common, hours and access are increasing, and, in general, the number of service points is not declining. The study found dramatic increases in learning spaces between the new libraries and the buildings they replaced. These types of spaces included but are not limited to group study areas, learning commons, library classrooms, and quiet reading areas. All respondents reported increases in use of the new facility, even several years after project completion. Respondents also indicated that the new library was seen as a center of academic and cultural life at the institution. The busiest areas of the new buildings



were those areas—particularly collaborative study areas—most closely associated with their role in supporting academic work.

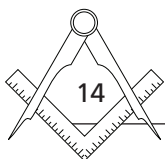
The Stewart study built on two earlier studies. The first of these (Shill & Tonner, 2003) examined 160 new and renovation academic library projects completed between 1995 and 2002. Findings included an increase in library remodeling and construction as well as an increase in facility size. Non-library facilities in new library buildings increased, as did the amount of general use seating, suggesting that space formerly reserved for print collections was either accounted for in the new space or redistributed as user space in the new design. Provisions for print growth collections were not evident in all projects, and nearly a third of survey respondents indicated the presence of an offsite storage facility. Significant improvements in technological infrastructure, type and variety of seating, and other user-oriented design elements were seen in all projects. Overall, staff satisfaction with the new facilities was high, with the exception of HVAC and other environmental control systems. The authors suggest that these new library spaces represent a shift in thinking about library buildings from spaces devised primarily to store material to ambient environments that encourage use. Shill and Tonner (2004) also studied usage of these new buildings by selecting 90 projects with adequate pre and post construction gate count data. Eighty percent of the libraries showed continued usage increases, with newer projects showing the greatest usage increases. Using statistical analysis to determine relationships between specific physical attributes and library usage, the authors determined that most technological improvements (i.e., more data outlets, more public workstations, better technology infrastructure) correlated with increased usage. Other attributes that related to increased usage include quality (*not* quantity of these attributes, which was often found to have no correlation) of work and learning spaces. Other positive correlations were found with basic elements such as availability of natural lighting and overall ambience, suggesting strong user affinity for the library as place. A surprising *lack* of correlation was established with library location on campus, the presence of coffeehouses and cybercafés in the library, and number and types of non-library units in the building. Shill and Tonner make several suggestions for further research aimed at better informing library facilities planning.

Bennett's (2003) study, funded by the Council on Library and Information Resources (CLIR), included 379 new U.S. academic library buildings and renovations completed between 1992 and 2001. The study included an extensive survey questionnaire. Bennett's results indicated that growth of collections remained the leading planning factor for academic library building projects through the 1990s, followed by the need to redesign student study space in the library. In extending work begun by Bennett, Stewart's (2010) study found that, by the 2000s, growth of collections was no longer the leading planning factor for new academic library buildings.

A number of new academic library buildings completed in recent years are documented in popular and professional literature. Design of the East Commons at Georgia Institute of Tech-

nology, which planners hope will serve as a model for learning space in the modern academic library, was influenced by some of the findings and recommendations in Bennett's CLIR study (Bennett, 2003). The Ekstrom Library addition at the University of Louisville includes collaborative spaces inside and outside the building; a coffeehouse/café; greatly expanded exhibit areas; and media-ready auditorium for lectures and seminars. The Ekstrom expansion is an excellent example of space planning informed by evolving research that supports the efforts of many academic libraries to create more placed-centered buildings (Albanese, 2006). Sustainability and integration into the surrounding natural environment are major themes in several other recent academic library building projects, including the William H. Hannon Library at Loyola Marymount University ("LMU's High-Tech Hannon Library," n.d.) and 350,000 square foot Henry Madden Library at California State University, Fresno (Szalay, 2009). Loyola University's Richard J. Klarchek Information Commons, completed in 2008 and one of the earlier academic library building projects to achieve LEED certification, has glass exposures on both sides of the building, offering dramatic views of Lake Michigan to the east. Other sustainable design elements of this facility include a dual temperature radiant ceiling, natural and hybrid ventilation, and automated shading, and daylight harvesting (McLauchlan & Lavan, 2010). The University of Nebraska Lincoln (UNL) Library Depository Retrieval Facility, one of the offsite storage facilities completed in recent years and included in this study, is described in a case study (Pearson & Busch, 2007). This outline of the design and implementation processes for the storage facility details activities such as shelving layouts (using a planography), tray sizing (trays holding 15 volumes store roughly 70% of the collection), and forklift operation. Initially, 400,00 volumes were relocated to the facility, which has a capacity of one million volumes. It should also be noted that three UNL library branches, all science libraries, were closed as part of the depository implementation.

Two very recent, major academic library building projects that have received a great deal of attention are the James B. Hunt Jr. Library at North Carolina State University (NCSU) and the Mary Idema Pew Library Learning and Information Commons at Grand Valley State University (GVSU). Maurice York (2013) outlines the core elements of the technology infrastructure at Hunt Library and describes the various types of technology infused learning spaces—including the large-scale display spaces research/infrastructure in the 221,000 square foot library. One of the principles adopted for technology planning for Hunt Library was to provide access to emerging technologies in the space for the entire university community. York's colleague at NCSU, computer science professor Michael Young, describes the changing relationship between the library and faculty as an important design factor and a key to the success of the new building. Faculty were invited to be full partners in the design planning and, as a result, feel a strong ownership of the facility and collaborate with librarians on a range of teaching and research projects in the new facility (Young, 2013). Young's testimony provides a positive contrast to what Bennett described a decade earlier as "fractured responsibility within the campus community for library space planning (Bennett, 2003, p. 2).



Design of the 150,000 square foot Mary Idema Pew *Library Learning and Information Commons*, completed in 2013, was heavily informed by changing modes of student learning, particularly team-based learning and the use of a range of media (Kackley, 2014). GVSU library dean Lee Van Orsdel highlights the importance of the rapidly changing ways students learn in the planning and design of the facility. Van Orsdel describes the building as zones, each of which provides for different learning kinds of learning (Van Orsdel, 2014). Unlike the Hunt Library, the physical collection at GVSU remains onsite in both browsable stacks and an automatic storage retrieval system, which is also a core design feature of the building. Both the Hunt and Pew libraries were designed to achieve high-level LEED certifications.

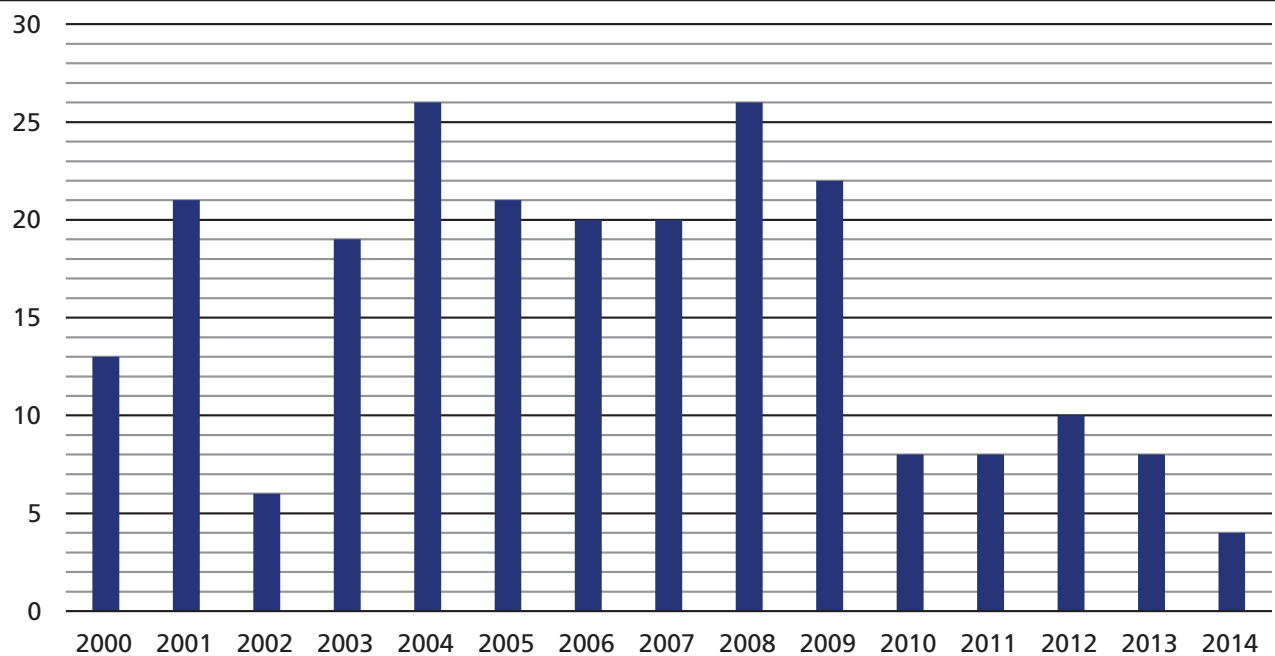
Major trends and developments in academic library design are reflected in the results of the studies as well as the individual projects discussed here. In considering overall building activity, one may consider possible connections between planning and design factors and the circumstances of academic library construction. For example, what are the implications for new library building construction given the increased focus on student outcomes? How are institutional priorities reflected not only in library design, and what types of institutions are building new libraries? A quantitative overview, based on institutional characteristics, of new library construction between 2000 and 2014 offers opportunities to draw possible connections.

Results and Discussion

Overall Academic Library Construction Activity, 2000–2014

Between 2000 and 2014, there were 232 new academic library buildings completed in the United States and Puerto Rico (see Figure 1). More projects were completed in 2008 than in any other year in the study. In that year, 26 projects were completed. With the exception of 2002, which saw only six new projects completed, 2014, with four projects, saw the fewest new library new academic library buildings completed. *It should be noted here, however, that, as some (not all) of the sources used to ascertain information on building projects completed in 2014 may not have included projects completed in the latter months of the year. Should additional projects completed in 2014 be discovered, this paper will be appended accordingly. It is not anticipated, however, that the number of projects for 2014 will increase significantly.* Of the 232 projects completed over 14 years, approximately 75% were completed by the end of the year 2008. Over the past several years, there has been a marked decline in new library construction. While 2012 saw a slight uptick in new projects, as measured in number of projects completed, there has been a 70% decline in new library construction between 2000 and 2014. That decline has been more precipitous over the past six years. Between 2008 and 2014, there has been an 85% decline in new library construction.

Figure 1. Number of New U.S. Academic Library Buildings Completed, 2000–2014



The overall trend in new academic library construction over the past 14 years is downward. The results show what is likely a long term and permanent new reality. These results present several questions, however, many of which will be addressed in this analysis as the data are viewed from different angles. Before that discussion, however, it is worth noting again that these results do not include library renovations and most additions. Results of ongoing data collection work show approximately 275 academic library renovation projects between 2000 and 2014. These results will be discussed in a follow-up study. New construction represents a level of investment in library space that merits its own discussion. What the data show are that in U.S. higher education, that level of investment in new library buildings is declining. One may ask, however, if that level of investment is declining across all types of institutions U.S. higher education. To address that and other questions, we look to the study population in comparison to the overall population of U.S. not-for-profit post secondary institutions.

Types of Institutions Completing New Academic Library Buildings

A starting point for organizing and framing these data is institutional type, which is mapped to Carnegie Basic Classification in these results. Most of the data in this study will be framed by Carnegie Classification descriptors. The Carnegie Classification of Institutions in Higher Edu-

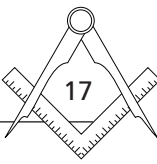
ation™ is the “leading framework for recognizing and describing institutional diversity in U.S. higher education” (Carnegie Foundation, n.d.). Data in this study if this study are mainly organized around all inclusive classifications, including Basic Classification Enrollment Profile, and Size and Setting. Classifications will be defined as study results warrant.

Organized according to Basic Classification, which categorizes institutions into six broad categories, the majority of institutions completing new academic libraries between 2000 and 2014 were doctoral granting institutions, namely research universities. Institutions in this category grant over 20 doctoral research degrees per academic year, excluding professional and/or specialized institutions such as medical colleges and independent law schools (Carnegie Foundation, n.d., Basic Classification Description, ¶4). As shown in Table 1, while 65 doctoral research universities built new libraries, 55 Master’s Colleges/Universities built new libraries. Master’s Colleges and Universities, which are subdivided as small medium or large, are institutions that award a minimum of 50 master’s degrees per year, and no more than 20 doctoral degrees (Carnegie Foundation, n.d., Basic Classification Description, ¶5). New libraries were completed at 43 Baccalaureate Colleges, which include “institutions where baccalaureate degrees represent at least 10 percent of all undergraduate degrees and where fewer than 50 master’s degrees or 20 doctoral degrees” are awarded (Carnegie Foundation, n.d., Basic Classification Description, ¶6). There were 56 new libraries completed as Associate’s Colleges, which comprise mainly in-

Table 1. Type of Institutions Completing New Academic Library Buildings and Approximation of Institutions in Study to U.S. Higher Education Population

Type of Institution (Carnegie Class)	Number of Institutions that Built New Libraries (n=232)	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Associate's Colleges	56	24%*	1,168	34%
Baccalaureate College	43	19%	671	20%
Master’s College/ University	55	24%	651	19%
Doctoral/Research Universities	65	28%*	286	8%
Special Focus Institutions	12	5%*	610	18%
Tribal Colleges	1	.4%	32	1%
Total	232	100%	3,418	100%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.



stitutions that grant two-year degrees (though a small percentage of bachelor's degrees may be granted at a small number of these institutions). New library buildings were completed at twelve Special Focus Institutions. Special Focus institutions, a broad Carnegie category, includes institutions that grant "baccalaureate or higher-level degrees where a high concentration of degrees (above 75%) is in a single field or set of related fields." (Carnegie Foundation, n.d., Basic Classification Description, ¶7). One Tribal College saw construction of a new library building between 2000 and 2014.

Viewed as individual groups of institutions by Carnegie category does not reveal much beyond basic numerical data. While these data are useful for inventory purposes, they must be viewed within the context of population in order to show possible patterns and/or themes. Here, there are two populations for consideration: first, the study population (discussed in detail in the methods section of this study) of 232 public and not-for-profit private institutions where new library buildings have been completed since 2000, and second, the parent population of 3,418 public and private, not-for-profit institutions of higher education in the United States and its territories. It is useful to compare the approximation of institution types in both groups side-by-side. This provides a lens by which we can begin to discern possible patterns in library construction across U.S. higher education. These comparisons are shown in Table 1. To illustrate, 24% of the institutions (56 out of n=232) that built new academic libraries between 2000 and 2014 are classified as Associate's Colleges. There are 1,168 Associates Colleges in the parent population of U.S. higher education, comprising 34% of the population on the whole. The difference between representativeness of institutions in the study to the parent population is approximately 42%. In this analysis, differences of 30% or more between percent of institutions in the study and the parent population will be noted in tables and the discussion. Associate's Colleges are thus underrepresented in the study and in terms of academic library construction activity between 2000 and 2014. On the other hand, Doctoral-granting universities, described in these results as doctoral/research universities comprise 28% of the institutions completing new library buildings between 2000 and 2014. However, only 8% of institutions in U.S. higher education are doctoral/research universities. Thus, new library construction activity in this institutional category is much greater than one may expect based on representation in the parent population. Finally while focus institutions comprise approximately 18% of the parent population of not-for-profit U.S. higher education, only 5% of institutions completing new library buildings since 2000 are special focus.

Through the lens of Basic Carnegie classification, only two institutional types, doctoral research universities and master's colleges and universities, saw library construction activity at higher levels than may be expected given their representation in the overall population of U.S. higher education. Community colleges and special focus institutions built at an even lesser pace in an already slow 15 years of academic library construction. The study period saw two econom-

ic downturns: the recession of the early 2000s, and the Great Recession of 2007–2009. Public institutions, particularly those primarily funded by local property tax revenues such as community colleges, were particularly affected. However, what of special focus institutions, most of which are private? Most of these institutions (and all in this study) are graduate/professional schools. One may consider the declining importance placed on library physical space in these service environments as a possible explanation for the very limited construction activity compared to other types of institutions. Before that discussion, however, we turn another Carnegie descriptor, institutional control.

Public or Private

Public or private control provides a way of tightening the lens for viewing academic library construction since the turn of the century. As discussed earlier, the parent population includes all public institutions and private, not-for-profit institutions (N=3,418). As shown in Table 2, representation of two-year institutions, all of which included in the study are public, remains as 24% of the study population. Baccalaureate colleges under public control are represented at a much higher rate in the study than they are in the parent population. Eight percent of the institutions in the study population that built new libraries are publically controlled, undergraduate institutions versus four percent of these types of institutions in the parent population. Publically controlled masters colleges and universities are also represented in the study population

Table 2. Basic Carnegie Classifications of Public Institutions Completing New Academic Library Buildings, 2000–2014

Carnegie Classification	Number of Institutions that Built New Libraries (n=222)	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Associate's Colleges	56	24%	1,054	31%
Baccalaureate College	19	8%*	137	4%
Master's College/ University	31	13%*	271	8%
Doctoral/Research Universities	43	19%*	177	5%
Special Focus Institutions	0	0%	41	1%
Tribal Colleges	1	.04%	24	1%
Total	150	65%	1,704	50%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

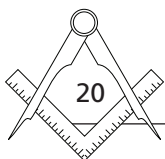
at percentage differences of more than 30% compared to parent population. Table 3 shows the differences in construction activity between public and private institutions in these two categories. While construction of new library buildings at public baccalaureate institutions occurred at greater levels based on population approximation, construction at privately controlled baccalaureate institutions occurred at a lower level. Ten percent of baccalaureate institutions completing new library buildings between 2000 and 2014 are privately controlled, compared to 16% of these types of institutions in the parent population. For master's colleges and universities, the percentage of private institutions completing new academic library buildings is roughly equal to the percent of these types of institutions in overall population of U.S. not-for-profit institutions.

The most dramatic difference in approximation between study and parent population, however, are found between in the doctoral/research university group. As shown in Table 2, doctoral research universities—particularly public universities—were represented in the study sub-population at much higher rates than the percentage of these types of institutions in the parent population of U.S. higher education. Nearly 20% of institutions completing new academic library buildings since 2000 are publically controlled doctoral research universities. These institutions comprise only 5% of the overall population in not-for-profit U.S. higher education. These differences are also reflected for privately controlled institutions (see Table 3). Only three percent of U.S. not-for-profit institutions are privately controlled doctoral/research universities. However, these types of institutions comprise 10% of the institutions that have built new completed new academic library buildings in the last 14 years. Thus, nearly a third of all new academic library construction between 2000 and 2014 occurred at doctoral research universities.

Table 3. Basic Carnegie Classifications of Private, Not-for-Profit Institutions Completing New Academic Library Buildings, 2000–2014

Carnegie Classification	Number of Institutions	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Associate's Colleges	0	0%*	114	3%
Baccalaureate College	24	10%*	534	16%
Master's College/ University	24	10%	380	11%
Doctoral/Research Universities	22	9%*	109	3%
Special Focus Institutions	12	5%*	569	17%
Tribal Colleges	0	0%	0	0%
Total	82	36%	1,706	50%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.



Public master's institutions built at greater levels than these institutions are represented in the parent population. Private master's were represented at approximately equal percentages (see Table 3). In addition, as discussed, public baccalaureate institutions, while a relatively small institutional category in U.S. higher education, were represented in the study population at far higher levels than in the parent population. In a 15-year period in which overall construction activity is down, investment by public institutions in new library space far outpaces investment by private institutions. There are likely myriad reasons for this discrepancy, including funding cycles, funding sources, and competition for financial resources; but also the possibility of diverging views in the role of the library building from the perspective of leaders at public versus private institutions. Similarly, new library construction at special focus institutions, which are primarily private and graduate-level, has come to a halt in recent years. Special focus institutions, all of which in the study population are private, were significantly underrepresented in the study when compared to their numbers in the parent population. These types of institutions comprise 17% of the overall population of U.S. not-for-profit institutions. However, only 5% of the institutions completing new academic libraries since 2000 were private, special focus. On the other hand, while public colleges and universities have invested in library building projects, community colleges were represented at lower levels in the study population than in U.S. higher education. So, while four-year public institutions have invested comparatively well in a period of declining building activity on the whole, two-year public institutions have not fared as well. As the campus library at the two-year institution is typically the only library building serving the campus (and, often, the surrounding community), it will be interesting to track construction and renovation in this institutional category in the coming years. Among other things, the U.S. community college system plays a vital and growing role in the transition from K–12 to four-year institutions. As such, library facilities and services at these institutions frames students' understanding and expectations for the library experience later in their academic careers.

In general, academic library construction occurred at greater rates at public institutions, based on population approximations, than private institutions when viewed through the lens of basic Carnegie classification and public/private institutional control. Construction at public *and* private doctoral/research universities, however, which together comprise approximately a third of institutions in the study, far outpaced the percentages of these types of institutions in the overall U.S. higher education population. These data provide several avenues for exploration, mainly related to service environment. Typically, doctoral research universities have large—often very large—undergraduate populations. (Though this is not always the case: several large doctoral research universities such as Yale, Duke, and Northwestern, have student populations that are majority graduate/professional.) One may surmise that new library construction at these institutions has been in recent years centered on library space that is designed to serve both graduate and undergraduate populations as branch and departmental libraries close or consolidate. Or,

given the given the growing influence of learning space—particularly learning space that is programmed to compliment undergraduate curricular outcomes—when institutional investment is being made in new library space, it is being made primarily with the undergraduate experience in mind. Considering case studies (some discussed earlier in this paper) and other descriptive information on recent academic library building projects at many doctoral research universities, planning and design considerations generally emphasize undergraduate learning spaces.

Enrollment Profile

A different if not perhaps sharper lens to view new academic library construction is the enrollment profile of institutions completing new buildings. Carnegie enrollment profile classification “provides a bird’s eye view of the student population by grouping institutions according to the mix of students enrolled at the undergraduate and graduate/professional levels” (Carnegie Foundation, n.d., Basic Classification Description, Enrollment Profile¶1). There are seven profiles, ranging from exclusively two-year undergraduate institutions to institutions that enroll only graduate/professional students. Table 4 provides descriptions of each profile, all of which are used in this analysis. Framing new library construction in the context of enrollment profile

Table 4. Carnegie Classifications, Enrollment Profile

<p><i>ExU2: Exclusively Undergraduate 2-Year</i> Fall enrollment data show only undergraduates enrolled at these associate’s degree granting institutions.</p>
<p><i>ExU4: Exclusively Undergraduate 4-Year</i> Fall enrollment data show only undergraduates enrolled at these bachelor’s degree granting institutions.</p>
<p><i>VHU: Very High Undergraduate</i> Fall enrollment data show both undergraduate and graduate/professional students, with the latter group accounting for less than 10 percent of FTE* enrollment.</p>
<p><i>HU: High Undergraduate</i> Fall enrollment data show both undergraduate and graduate/professional students, with the latter group accounting for 10–24 percent of FTE enrollment.</p>
<p><i>MU: Majority Undergraduate</i> Fall enrollment data show both undergraduate and graduate/professional students, with the latter group accounting for 25–49 percent of FTE enrollment.</p>
<p><i>MGP: Majority Graduate/Professional</i> Fall enrollment data show both undergraduate and graduate/professional students, with the latter group accounting for at least half of FTE enrollment.</p>
<p><i>ExGP: Exclusively Graduate/Professional</i> Fall enrollment data show only graduate/professional students enrolled</p>
<p>Source: Carnegie Foundation for the Advancement of Teaching</p>

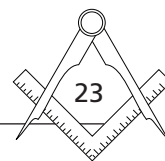
provides an opportunity to identify possible connections between investment in new academic library space and student populations. This approach also continues the analysis based on one of the primary research questions for this study: key institutional attributes of colleges and universities completing new academic library buildings, and how are these types of institutions represented in the study population.

Between 2000 and 2014, 59 exclusively undergraduate, two-year institutions—mainly, publicly controlled community colleges—completed new academic library buildings. As shown in Table 5, while institutions in this enrollment profile are heavily represented in the study population at 24% of the cohort, two-year institutions comprise 33% of the parent population of U.S. not-for-profit institutions of higher education. Thus, they are underrepresented in the sub-population. Exclusively undergraduate four-year institutions comprise 14% of the parent population of U.S. higher education and only 10% of the study population. The remaining undergraduate enrollment categories, however, are overrepresented in the study population when compared to the parent population. For example, new libraries were completed at 54 institutions in with greater than 75% undergraduate populations. Institutions of this enrollment profile comprise

Table 5. Enrollment Profile of Institutions Completing New Academic Libraries and Approximation of Institutions in Study to General U.S. Higher Education Population

Enrollment Profile	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
ExU2: Exclusively Undergraduate 2-Year	59	25%*	1,128	33%
ExU4: Exclusively Undergraduate 4-Year	22	10%*	465	14%
VHU: Very High Undergraduate	45	19%	587	17%
HU: High Undergraduate	54	23%*	526	15%
MU: Majority Undergraduate	35	15%*	290	8%
MGP: Majority Graduate/Professional	9	4%	178	5%
ExGP: Exclusively Graduate/Professional	7	3%*	241	7%
Total	231	99%	3,415	99%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.



15% of the U.S. higher education population, but comprise 24% of the study population. Similar differences are seen the majority undergraduate enrollment profile, which comprise only 8% of the parent population but 15% of the institutions completing new academic library buildings. For institutions with undergraduate enrollments of more than 90%, representation is moderately higher (11%) in the study population than the parent population: less dramatic than the other undergraduate enrollment profiles, but an increase nonetheless. As graduate enrollments increase, the percentage of institutions completing new academic libraries decreases. Only seven exclusively graduate/professional institutions built new libraries between 2000 and 2014: 3% of the study population versus 7% of these institutions in the parent population of U.S. not-for-profit higher education.

When including the variable of public/private control, we see a significant representation in the study population of publically controlled institutions with large undergraduate populations versus private. Tables 6 and 7 contrast the differences in new library construction between enrollment profiles of public and private institutions. Fourteen public, exclusively four-year institutions completed new libraries. This number represents 6% of the study population. While that percentage may not seem significant, it is 100% higher than the percentage of public, exclusively four-year institutions in the overall population of U.S. not-for-profit higher education. On the other hand, as shown in only eight private institutions in this enrollment profile completed new libraries between 2000 and 2014. This number represents 3% of the study population compared to 11% of the parent population being private, exclusively four-year undergraduate institutions. Twenty-four publically controlled institutions with very high undergraduate enrollments completed new libraries—10% of the study population versus 7% of the parent population. For private institutions in this enrollment profile, the percentage in institutions in the study that completed new libraries is 9%, slightly less than the percentage of these institutions in the parent population. Differences in representation in the study versus parent populations for high and majority undergraduate, private institutions does not differ markedly. On the other hand, publically controlled institutions with high undergraduate enrollment comprised 17% (40 libraries) of the study population versus only 7% of these types of institutions in U.S. higher education. Similarly, publically controlled institutions with majority undergraduate populations comprise 6% (13 libraries) of the study population versus only 1% of this enrollment profile in U.S. higher education. No publically controlled institutions with either majority or exclusively graduate/professional student enrollment completed new academic library buildings between 2000 and 2014. These data are consistent with the fact that most (and in the case of exclusively graduate/professional enrollment, all) of these institutions are privately controlled.

When academic library construction is viewed through the dual lens of enrollment profile and institutional control, differences between construction activity at public versus private institutions emerge. In these differences, we find much higher levels of new construction at publi-

Table 6. Enrollment Profile of Public Institutions Completing New Library Buildings, 2000–2014

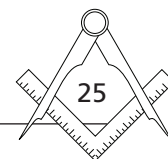
Enrollment Profile	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Exclusively 2-Year	58	25%	1,032	30%
Exclusively 4-Year	14	6%*	100	3%
Very High Undergraduate	24	10%	246	7%
High Undergraduate	40	17%*	242	7%
Majority Undergraduate	13	6%*	45	1%
Majority Graduate/ Professional	0	0%	25	1%
Exclusively Graduate Professional	0	0%	14	0%
Total	149	64%	1,462	49%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

Table 7. Enrollment Profile of Private, Not-for-Profit Institutions Completing New Library Buildings, 2000–2014

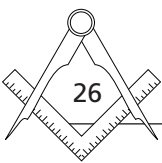
Enrollment Profile	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Exclusively 2-Year	1	.4%	96	3%
Exclusively 4-Year	8	3%*	365	11%
Very High Undergraduate	21	9%	341	10%
High Undergraduate	14	6%	284	8%
Majority Undergraduate	22	9%	245	7%
Majority Graduate/ Professional	9	4%	153	4%
Exclusively Graduate Professional	7	3%*	227	7%
Total	82	35%	1,711	50%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.



cally controlled institutions with sizable undergraduate populations. We can assume that, given the very high percentage of doctoral/research universities in the study population, that many (though certainly not all) of these institutions with high and majority undergraduate student populations are doctoral/research institutions. The question that remains is whether these new libraries at doctoral/research institutions are intended for undergraduate student populations. Given the research and commentary (discussed earlier in this paper) on branch and departmental closures, we may assume that libraries constructed over the past 15 years at these doctoral/research universities are designed to serve the campus population as a whole. With the large and overrepresented number of high and majority undergraduate population institutions in the study, these data, combined with disproportionately high percentages in the study of public institutions serving exclusively and very high undergraduate student populations indicate a trend of library planning that is heavily (though not exclusively) influenced by undergraduate needs.

While there are several institutional variables in which this study is concerned, enrollment profile is perhaps the most revealing. Public, four-year institutions with very high undergraduate enrollments were represented at significantly higher levels in the study sub-population than the parent population of U.S. higher education. Public institutions with majority and high undergraduate populations—the former very typical for public doctoral research universities—were represented at significantly higher levels in the study population than the parent population. Private institutions with very high, high, and majority undergraduate enrollments were represented at approximately equivalent percentages in the study. Thus, institutions that are building new libraries are those with large undergraduate populations—both public and private, but particularly public. A number of doctoral research universities in the United States are majority graduate/professional enrollment (e.g., Duke, Yale, Northwestern). These institutions are, for the most part, private. Two of the institutions listed above completed new library building projects in the last decade. On the whole, majority graduate/professional enrollment institutions were represented at the same levels in the study populations (see Tables 6 and 7). On the other hand, while there have been some exciting projects such as the library space at the Erikson Institute in Chicago, institutions with exclusively graduate/professional enrollments have seen precipitous declines in library construction over the past 15 years. With the exception of mainly private, majority graduate/professional enrollment institutions, there is a general tendency, based on expected values of the population for less—often far less—investment in new library buildings in relation levels of graduate/professional enrollment. To a certain degree, this is a predictable result in a period of declining academic library construction. For many graduate/professional programs, including medicine and business, the literature of the discipline has migrated to primarily digital formats, thereby removing the need for physical library space for collections. As we know, however, the role of the library physical space has changed dramatically over the past two decades. This evolution is very clear in library projects—particularly at four-year institu-



tions—in recent years. Space for collections is no longer a primary design consideration. The decline in emphasis and interest in library space tells us as much about how these spaces are programmed and, by extension, the role of the library building in graduate/professional education.

Institutional Setting

Institutional setting, a primarily undergraduate categorical frame, is included in twofold Carnegie descriptors that include percentage of students living on campus and enrollment. Residential categories are either primarily residential or highly residential. Primarily residential settings include institutions where “25–49 percent of degree-seeking undergraduates live on campus, and at least 50 percent attend full time” (Carnegie Foundation, n.d., Basic Classification Description, Size and Setting).

Highly residential campuses include institutions where “at least half of degree-seeking candidates live on campus, and at least 80 percent attend full time” (Carnegie Foundation, n.d., Basic Classification Description, Size and Setting). There are four categories for total FTE enrollment, ranging from very small bachelors degree granting institutions to large (more than 10,000 students) bachelors degree granting institutions. Community colleges and specialty, exclusively graduate/professional institutions are not included in these categories. Due to the range of institutional types in this study, the enrollment/setting category was not used in the analysis. Rather, enrollment profile was cross-tabulated with setting.

Institutions whose classification information included information on setting were described as either residential or nonresidential in the study results. Institutions that were either primarily or highly residential were placed in the category of residential, then further subdivided into primarily and highly residential. Institutions listed by Carnegie as primarily nonresidential were placed in the category of nonresidential. Institutions with Carnegie setting descriptors of residential and nonresidential do not include community colleges and specialty institutions. These are obviously very general categories for description and are used as a starting point for a discussion on possible links between institutional setting and investment in new library buildings.

The filter of institutional setting provides another opportunity to investigate the relationship between undergraduate enrollments levels at four-year institutions and new library construction. As shown in Table 8, nearly half ($n=102$) of the new library buildings completed between 2000 and 2014 were at institutions classified as either primarily or highly residential. While 33% of institutions in the parent population are residential, 44% of institutions completing new library buildings are residential campuses. Both public and private residential campuses are represented in the study population at significantly greater percentages than these institutions are represented in the parent population of U.S. not-for-profit higher education. As shown in Table 9, sixteen percent ($n=38$) of the residential institutions completing new

Table 8. Setting of Institutions Completing New Academic Library Buildings, 2000–2014

Setting	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Residential	102	44%	1,133	33%
Nonresidential	77	33%*	511	15%
Total	179	77%	1,643	48%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

academic libraries are public, versus 9% of the parent population comprising public, residential institutions. Table 10 shows that private, residential institutions are also solidly represented in the study population, with 64 institutions completing new libraries. This number represented approximately 28% of the study population, compared to 20% of the parent population categorized as private, residential campuses. When enrollment profile is included, activity in the residential institution category becomes more distributed and percentages in the sub-population more closely approximate the parent population. However, results still indicate (see Table 11) that new building construction occurred at higher rates at very high, high, or majority undergraduate enrollment institutions in the study population than the parent population. Interestingly, when adding enrollment profile to the analysis, nonresidential institutions are represented at higher or approximately even levels in the study population as they are in the parent population. These data reinforce results shown in the analysis of new construction by enrollment profile only, namely high levels of construction activity at institutions with high and majority undergraduate populations (see Tables 11 and 12) in both residential and non-residential settings.

Table 9. Setting of Public Institutions Completing New Academic Library Buildings, 2000–2014

Setting	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Residential	38	16%*	316	9%
Nonresidential	65	28%*	304	9%
Total	103	44%	620	18%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

Table 10. Setting of Private Institutions Completing New Academic Library Building, 2000–2014

Setting	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
Residential	64	28%*	688	20%
Nonresidential	12	5%	207	6%
Total	76	33%	895	26%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

Primarily residential institutions comprise 18 percent (n=42) of the study population, and 15 percent of the parent population of U.S. not-for-profit higher education. Of the 102 residential institutions completing new libraries between 2000 and 2014, nearly two-thirds (n=60) are at highly residential institutions—where at least half of degree-seeking undergraduates live on campus, and at least 80 percent are full time students. These institutions comprise 27% of the study population, compared to 19% of the parent population. Put another way, institutions with largely full time, residential student populations are favored in the population of institutions that completed new library buildings between 2000 and 2014.

Table 11. Enrollment Profile of Residential Institutions Completing New Academic Library Buildings, 2000–2014

Enrollment Profile	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
ExU4: Exclusively Undergraduate 4-Year	8	3%	255	7%
VHU: Very High Undergraduate	35	15%*	358	10%
HU: High Undergraduate	26	11%	310	9%
MU: Majority Undergraduate	27	12%*	182	5%
MGP: Majority Graduate/Professional	6	3%	28	1%
Total	102	44%	1,133	32%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

Table 12. Enrollment Profile of Nonresidential Institutions Completing New Academic Library Buildings, 2000–2014

Enrollment Profile	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
ExU4: Exclusively Undergraduate 4-Year	13	6%	95	3%
VHU: Very High Undergraduate	9	4%	158	5%
HU: High Undergraduate	28	12%*	164	5%
MU: Majority Undergraduate	8	3%	63	2%
MGP: Majority Graduate/ Professional	2	1%	31	1%
Total	60	26%	511	16%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

On the whole, institutions in residential and nonresidential categories in the study were represented dramatically higher in the study population than the parent population. This is likely a result of the fact that institutions in the study with residential or nonresidential designations have sizable undergraduate enrollments. When institutional control is factored, however, private nonresidential institutions are represented at slightly lower levels in the study population than the parent population. The additional layer of enrollment profile reveals a familiar undergraduate theme. As shown in Table 13, for example, nonresidential public institutions with high and majority undergraduate enrollment populations were represented in the study at far higher levels than their percentages in the parent population. Undergraduate enrollment is a leading factor associated with new academic library construction at both residential and nonresidential campuses. This fact, coupled with the overrepresentation of doctoral research universities in the study, imply that new libraries, in a period of fairly rapid decline in academic library construction, are still being built at large (mainly public) institutions with sizable undergraduate populations.

Viewed through the lens of institutional setting and enrollment profile, a general pattern emerges. Through case studies, reports, and other material, we find examples of major library building projects completed at institutions that serve predominantly undergraduate populations. For example, Goucher College's Athenaeum, completed in 2009, offers an array of amenities including exercise equipment (Carlson, 2009, ¶20). While the Goucher project is in many ways exceptional, the facility includes many, design elements focused on the undergraduate ex-

Table 13. Enrollment Profile of Nonresidential Public Institutions Completing New Academic Library Buildings, 2000–2014

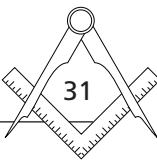
Enrollment Profile	Number of Institutions that Built New Libraries	Percent of Institutions that Built New Libraries	Number of Institutions in Population (N=3,418)	Percent of Institutions in Population
ExU4: Exclusively Undergraduate 4-Year	13	6%*	63	2%
VHU: Very High Undergraduate	8	3%	104	3%
HU: High Undergraduate	25	11%*	113	3%
MU: Majority Undergraduate	7	3%	23	1%
MGP: Majority Graduate/Professional	0	0%	1	0%
Total	54	23%	304	9%

*Greater than 30% difference in percent of institutions that built new libraries and percent of institutions in population.

perience, including intentional social spaces, common to new academic library buildings. In a larger scale, the recently completed Mary Idema Pew Library at Grand Valley State University includes an array of programmed spaces designed to strengthen the undergraduate learning experience (Van Orsdel, Webber, & Stevens, 2014). These and other recently completed library buildings at undergraduate-serving institutions are both learning space and social space. In many ways, they assume roles and functions that were once the domain of the campus student center. The function of new library space on these campuses provides another layer in understanding institutional goals for these buildings.

Function of New Library Building

When an institution invests in a new library building, what does it expect the facility to be? Knowing the function of the new building allows us to make inferences about the impact of a range of trends—from multi-use to closures and consolidations—in academic library planning and design. As the pace of academic library construction has varied over the last 15 years and, more specifically, declined in recent years, it is worthwhile to know the intended function of the buildings that were actually completed. In this study, basic information about the function of the new library was derived using a variety of methods, including project description and/or visiting the library website. Five basic categories were derived to describe the use of the new building: main library for campus; branch, subject, or departmental library (BSD), community



college campus library, special focus institution, and offsite storage facility. These are, of course, very general descriptions and are meant to provide a starting point for further analysis for research that may focus on institutionally specific factors influencing library design. Despite the broadness of these data, however, they do provide information, especially when broken out by year of construction.

Most of the new academic library buildings completed between 2000 and 2014 were designed to serve as the main library for the institution. This, of course, is not surprising given the fact that most institutions have only one library facility, though it is interesting to note that doctoral research universities typically have several libraries on campus. As shown in Table 14, peak years for academic library construction projects, 2001, 2004 and 2008, were also peak years for completion of branch, departmental, and subject libraries (BSDs)—both numerically and as a percentage of overall construction activity that year. Since 2004, the decline in BSD completion as a percentage of overall construction has been precipitous, from 27% of projects in 2004 to zero projects in 2014. Encouragingly, community college library construction as a percentage of overall construction has increased in recent years to half of the projects completed in 2012 and nearly half of those completed in 2013.

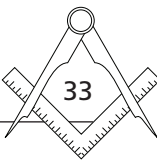
As community college libraries and (for the most part) specialty institution libraries are self-explanatory in their purpose, this analysis focuses on main libraries and branch, subject, or departmental libraries. Put another way, institutions that have one main library that serves the campus, or multi-library institutions. Given the preponderance (nearly one third of the study population), of doctoral/research institutions in the study population, we can assume that most building activity in BSD libraries occurred here. In general, as construction of new main libraries has declined, so too has the building of branch and subject libraries. Table 14 further illustrates that between 2000 and 2014, 125 new, main libraries were completed. Thirty-eight BSD libraries were completed. In 2004, one of the busiest years for new academic construction with 26 total projects, seven BSD libraries were built, a number that has not been exceeded since. Looking at results across the entire study period, the percentage of BSD libraries to the total of main and BSD libraries has, with a few exceptions has never exceeded fifty percent of construction projects in a given year. During most of the busiest years for new library construction, the ratio of BSDs to main campus libraries was very small. In 2005, for example, only one BSD library was completed, compared to 14 main campus libraries. Between 2011 and 2013, one BSD library was completed each year. One of these, the James B. Hunt Library at North Carolina State University, is considered, in addition to serving engineering and other science disciplines, a second main library for the university (Hunt Library Facts | NCSU Libraries, n.d.).

In the coming years, it is likely that branch closures and consolidations will continue at doctoral research universities. These closures and consolidations, which began several years

Table 14. Function of New Library Buildings, 2000–2014

Year Completed	Number of New Buildings Completed and Function of New Facility					
	Main Library for Campus	Branch, Subject, or Departmental Library	Community College Campus Library	Special Focus Institution	Offsite Storage Facility	Total
2000	8	3	0	1	1	13
2001	12	6	2	1	0	21
2002	3	2	0	0	1	6
2003	13	1	5	0	0	19
2004	15	7	3	1	0	26
2005	14	1	5	0	1	21
2006	11	2	6	0	1	20
2007	11	1	5	3	0	20
2008	13	6	6	1	0	26
2009	11	4	5	2	0	22
2010	1	2	5	0	0	8
2011	3	1	2	1	1	8
2012	4	1	5	0	0	10
2013	3	1	3	0	1	7
2014	3	0	1	0	0	4
Total	125	38	53	10	6	232

ago, occur for a variety of reasons. Surely, one of the main drivers is the shift from print to digital formats in many disciplines, particularly STEM fields. For example, Stanford University’s Engineering Library has dramatically reduced space for physical collections (Sydell, 2010). In 2011, most of the physical collection was removed from Cornell University’s Engineering library (Martinez, 2010). While that library did not close, many departmental libraries have. While consolidation can be a result of the construction of a new facility as was the case with Princeton’s Peter B. Lewis Library, more often closure results in physical collections being consolidated into a main library or remote storage. When the book loses its claim on library real estate, branch and departmental libraries are particularly vulnerable. In coming years, closures and consolidations will likely continue. These closures and consolidations have important implications for the planning and configuration of library space that is retained—as well as how faculty and students who no longer have access to their own departmental library spaces are served. What is fairly clear is that consolidation is unlikely to occur within the context of a new building.

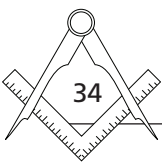


Limitations of the Study

Among other things, this study provides an inventory of academic library building projects during the first 15 years of the 21st Century. We can assume that design considerations for these spaces were informed by trends in academic library design that demark dramatically from planning and design factors that served academic libraries well for many decades. Methodologically, however, this data gathering procedures employed in this study, while extensive, are not perfect. As confident as I am with the comprehensiveness of the data presented here and the depth of the information sources used, I anticipate that there may be a few projects missed. For example, there is a possibility that information on all projects completed in 2014 was not released as of the completion of this study in early 2015. This paper will be appended should additional building projects become known. Information in this inventory, whether complete or near complete, however, certainly provides a broad enough data sample for the types of quantitative analysis offered in this study. This study is also limited to Carnegie descriptors. While the descriptors used here provide a solid system of organization, they are broad in scope and, as such, do not describe narrower institutional characteristics that could be of use in a more detailed analysis of institutional subgroups. Finally, this study covers new academic library buildings only. Renovations and smaller additions are not included. There have been numerous, major library academic renovation projects in recent years. These projects often represent significant design changes and extensive re-visioning of library space. Moreover, it is likely that, in the coming years, institutions will be far more likely to invest in existing library space than build anew. For these and other reasons, this study will continue with a second part that includes academic library renovations and additions between 2000 and 2014. The database for this study, based on information collected so far and that anticipated, is expected to include between 275 and 300 projects.

Conclusion

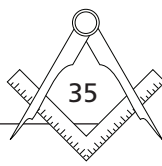
The 21st Century began with broad debate about the future of the academic library building. Frequently cited articles such as Scott Carlson's (2001) "The Deserted Library" described declining use of the academic library space as students accessed more library resources online and preferred bookstore-like cafes as social and study spaces over library reading rooms. While Carlson's article and similar commentary at the turn of the century seem simplistic (how many big box bookstores remain in the age of Amazon?) and overly pessimistic with the passing of time, the fact remains that, while enrollments in U.S. degree granting institutions have increased significantly (U.S. Department of Higher Education, National Center for Education Statistics, Fast Facts, ¶1), construction of new academic library buildings in the United States has declined dramatically since the turn of the century, most significantly since 2008. Decline, however, does not mean halt. From quantitative data on new library construction across specific institution-



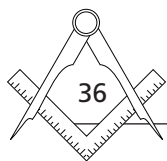
al types, we are provided a faceted view of new academic library construction from 2000 to the present. In framing the analysis through institutional variables, academic library building projects can be viewed in terms of institutional similarities and differences and, by extension, institutional priorities. Patterns emerge, especially when viewed through the lens of institutional representation in the study sub-population versus the population of U.S. higher education on the whole. Some patterns, such as the steep drop in library construction at special focus institutions, are, while disappointing, fairly predictable. Other trends, such as the relatively low level (when compared to institutional representation in the parent population) of new library construction activity in the community college sector, are troubling given the evolving and expanding roles of these institutions in U.S. higher education. Still other results, such as the relatively robust new library construction activity at public institutions with sizable undergraduate enrollments are nuanced given the interplay of other institutional variables such as institutional control and setting and, of course, the general decline in library construction overall. Nonetheless, we can imply, especially given the data on the function of so many of these new buildings, that the undergraduate population is an increasingly important factor in an institution's decision to build a new facility. Data for this study will be updated and expanded in the coming years as new projects come online and patterns identified here come further into focus. These and other data derived from this study provide a foundation for further inquiry, especially for those interested in the place of the library building in higher education today. The basic facts and patterns presented here can lead to more direct inquiry on investment in new library space and more specific institutional characteristics,—both quantitative and qualitative—including but not limited to cost, enrollment, demographics served, library leadership, and institutional success. We are in a period of some of the most innovative academic library design in decades if not longer. We can learn much about the future of the physical academic library by identifying and understanding the context in which new libraries are conceived, planned, funded, and ultimately built.

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