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Designed to Deliver: Building a Digital Collection to Support Research

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Abstract

For a university created from a scientific research institute, the importance of its library was essential for providing faculty with current literature. Yet, scientific and technical resources are some of the most expensive materials acquired by libraries. The 1980s and early 1990s was a very lean financial period. By 1998, the combination of a fundamental change in budgeting for acquisitions, the advent of digital delivery of information, and the rise in consortial purchasing arrangements created a surprisingly robust library environment. Within a twelve year period, a library previously deemed woefully inadequate became an asset to scientists and engineers needing scholarly resources. The electronic delivery of resources was such a fundamental change that it impacted the everyday use of the collections and the building. While this dramatic turnaround is hardly unique, the rapid adoption of electronic materials by researchers in combination with added services illustrates the importance of technological change in an academic library environment.

Keywords: digital library, ebooks

History of a New University Library

Unlike most academic libraries, the history of McDermott Library at the University of Texas at Dallas made experimentation into delivering collections electronically an obvious solution to amassing a broader level of scholarly resources to meet the needs of researchers in the 21st century. While the transition to the electronic format was essentially driven by outside forces, the conversion provided a level of support for research that would never have been provided without a convergence of several forces.

A research institute, created by the founders of Texas Instruments, Inc., was authorized by the Texas Legislature to become a component of the University of Texas in 1969. Unlike most institutions within higher education, the University initially created graduate

programs in the natural sciences to support the growing demand for technically trained graduates. In 1975, upper division undergraduates were added and, in 1990, the University became a complete four year university with a highly developed graduate component.

At present, the University has 30 doctoral programs and over 14,000 students. Within the University of Texas System, UT Dallas remains a medium-sized academic institution as compared to the flagship institution, the University of Texas at Austin.

The University provides strong programs in a number of technical disciplines including electrical and electronic engineering, physics, management (finance, operations research, and production management), chemistry, molecular and cellular biology, geographic information systems, nanotechnology, and brain and behavioral sciences. Other programs in more traditional fields (arts and humanities, social sciences, and education) are growing in popularity within the University.

Unlike a traditional liberal arts college, the University of Texas at Dallas programs demanded expensive journal collections in the sciences, mathematics, and engineering. Unfortunately, rather than adhering to a strict collection development policy which supported the curriculum and research efforts of the campus, the Library was developed from purchasing defunct libraries, mostly from religious institutions. Any and all strategies were employed to increase the total size of the collection. The strategy provided for a growing volume count, but not in the areas demanded by the faculty. The Library was judged inadequate as it did not attain a minimal status according to the Clapp Jordan formula, an antiquated measure calibrating the minimal adequacy of a library collection. The formula was based on the number of faculty members, degree programs, books, journals, government documents, and students. This statistic was not a true reflection of the demands of a productive faculty.

As the size of the faculty increased and as they were often recruited from academic institutions with fully developed research libraries, the Library was unable to support most research efforts. Comparing the collections of a new library to the strengths of any major research library resulted in a widening gap in the Library's ability to meet the expectations of a faculty recruited from elite academic institutions.

The Library used one creative approach to assist researchers with expanded access to periodicals. The Library hired a half-time position within the Interlibrary Loan Service at the University of Texas at Austin. The position expedited free fax delivery of articles needed by the students and faculty. As one of the early adopters of providing journal articles by fax, the Service was essential for maintaining access to current materials.

Mounting pressures from faculty members led to the creation of a Faculty Library Committee that was charged with monitoring the quality of the collections and advising the library administration of faculty needs. In an effort to appease the faculty, most monographic funds were allotted to the deans. The allocation to the deans created extreme biases in certain portions of the collections. Faculty purchases tended to support individual research efforts rather than a less biased approach. Unfortunately, with the addition of each new faculty member, it was unlikely that the collection strengths matched the research interests of the previous instructor.

The Lean Years

The majority of the budget in the early 1980s was allocated to support journal subscriptions in the sciences. Little money was available for other formats. Start-up funds to develop collections for new programs were non-existent. Monographic purchasing was often curtailed to support the double-digit increases in the small, but expensive periodical budget.

In 1983 and 1992, two budget crises resulted in the cancellation of 25-27% of the journals budget during each episode. Each dean was given a list of periodicals, standing orders, and reference indexes and was asked to cut a percentage of the total costs. Often, the reference indexes were the most expensive titles and the faculty asked that the Library eliminate these subscriptions. The Library eased this conflict by naming certain subscriptions as a core list. The titles on the list could not be eliminated.

In 1983, the Library subscribed to 3,500 journals. By 1994, the Library only subscribed to 2,500 titles. Faculty members were vocal in their complaints that the level of funding could not support their research efforts. The recruitment of new faculty members was impacted by the Library that failed to provide collections in specific areas of research.

Four Revolutions

At the same time that the quality of the library was paramount in the minds of faculty and the University administration, four major factors came together to forever change the organization. During the early 1990s, the lack of consistent budget support resulted in the adoption of a library fee levied on the students. The initial fee at UT-Dallas was \$2 per credit hour and rose to \$10 per credit hour over a 12 year period. The library fee became critical for most institutions within the University of Texas System which adopted this measure of insuring consistent funding for materials. Credit hour production soon became an indicator for predicting the materials budget. With the fee, the Library could count on a steady budget that met the inflationary increases as long as the enrollment was increasing. This level of semi-secure funding was a miracle for the struggling Library.

At the same time, publishers began creating products that provided for the delivery of electronic articles through optical disks. While the hundreds of encased compact discs were a struggle to maintain, the Library embraced aggregated collections. It became essential that the Library catalog contain the content provided through aggregators as it doubled the size of the periodicals collection. Unlike larger research libraries, the cataloging of these collections doubled the number of titles available. The Library never questioned whether electronic journal titles should be added to the catalog. The cataloging of all of the titles proved advantageous as the collection migrated to the Internet. Links to the content provided easy access to the archive for individual periodicals.

The third revolution was the result of hiring a new library director. The new administrator mandated a change in the allocation of library funds. The librarians took control of the library budget and faculty members and students were urged to suggest new titles for acquisition by the Library. A new collection development policy was written.

Finally, the library directors in the University of Texas System began to discuss how to leverage the buying

power of the institutions by purchasing materials together. The rise of the Internet platform made consortial purchases attractive.

The technical issues were daunting. The libraries began the program by purchasing periodical databases of locally mounted files. The University of Texas at Austin led the program by supplying computer support and later personnel to handle the licensing of collections. Remote access was non-existent but was added with the popularity of the Internet and became the normal way to connect to the resources.

Each institution was asked to vote on participation in any database or collection. As the System is comprised of academic and medical institutions, the collective journal title lists were extensive, particularly in the natural sciences. By combining all journals into a shared collection, the libraries were able to add thousands of titles never owned in the past. With the introduction of electronic journals and publisher package deals, the Library was able to again offer titles cancelled during the mass cancellations in 1983 and 1992. In addition, thousands of new titles were added to the mix and the systematic building a library to support research began.

With each semester, the UT System expanded the consortial collections. At present, the System purchases over 4,000 journals from a number of publisher collections including Wiley Interscience, JSTOR, Project Muse, Elsevier's ScienceDirect, Springer Link with Kluwer titles, IEEE, and Blackwell Synergy. The Libraries purchase major databases such as the Web of Science, Inspec, and SciFinder Scholar. Additional funds were made available to purchase major historic databases such as the Historical New York Times, Gerritsen Women's Collection, the Eighteenth Century Collection, and Early English Books Online (ProQuest).

In addition, University of Texas at Austin was able to fund an ongoing expenditure to explore the purchase of electronic books through NetLibrary. Each Library selects from a list of monthly offerings and a collection is purchased for the System. Record sets are made available to each institution to load into their local catalog system. At present, the Libraries have purchased nearly 300,000 electronic books through NetLibrary and a variety of historical databases.

The UT Dallas Library was able to exploit the digital revolution by moving from a minimal list of journals to offering a collective list of titles. The periodicals list expanded from 2,500 print titles to nearly 40,000 electronic journals. Every title was included in the

catalog with complete holdings down to the volume, issue, and date. Remote access was available for nearly every title and it became an essential way in support of distance learning. The catalog provided the backbone to deliver electronic journals, databases, and e-books. A proxy server was critical for the rapid delivery of electronic resources.

An analysis of the periodicals collection now shows a vast improvement in its quality as judged by the impact factor ratings used by the Institute of Scientific Information (ISI). The relevant categories were evaluated with respect to the number of titles owned in the top tier of journals. The improvements are clearly due to the consortial and aggregated deals entered into by the Library.

Reaction

While the migration to electronic journals was slow initially, the exposure of the faculty to the new digital library was even slower. The librarians promised the faculty that no print journal would be cancelled without determining if the online version of the title was complete online and that the quality of the digitization was equal or superior to the printed version. No cancellations were made if archival rights were not available. When a print subscription was purchased in combination with the online version, the print title was often not bound or retained if the online version was acceptable as an archive.

During the early 2000s, the quality of electronic journals was very uneven. It was not unusual that photographs or graphics were not digitized in color or were of poor quality. Some issues were missing from the journal archives or individual articles or pages were not available. Sometimes the electronic journals were not available until months after the delivery of the print version.

Initially, faculty members were not aware of the major changes occurring in the Library. It was common that they visited other academic libraries to obtain materials for their research. It was a surprise when they requested an item through interlibrary loan and were notified that the journal was available electronically. They were initially frustrated by the lack of a printed copy. Some faculty members wanted the copy to come from the actual paper if the file was not an image of the page.

These attitudes quickly disappeared as the sheer number of titles increased. While every title could not be

acquired electronically, the faculty became overly dependent upon an electronic journals list rather than searching the journal title in the library catalog. Searching the list did not expose a faculty member to a print title. For many, if the journal was not electronic, it no longer existed. Most students were no longer satisfied with any print journals unless their assignments mandated that they use the paper format. Many students expressed dismay that every article from standard indexes was not available electronically. The recent addition of a link resolver illustrated that students expected all content be available electronically.

The faculty reactions to the increase in content have been remarkable. Prior to the inception of the library fee, the University President and Provost routinely received complaints about the quality of the Library and it was a topic discussed at Faculty Senate meetings. In contrast, the Library is now a non-issue. Attendance at the Faculty Library Committee is spotty mainly because the quality of the Library is so well received. While the Library still does not satisfy the needs of many of the history faculty members, the scientists and engineers often rave about the quality of the periodical collections.

After years of dismal collections, the faculty continued to have concerns about the quality of the library and many were apprehensive about substituting electronic book collections for the traditional print. This attitude was strongly articulated from the results of two surveys concerning their knowledge and use of e-books.

The two surveys conducted in 2004 and 2005 indicated that while print books were still the choice of faculty members, many students expressed their preference for electronic books. The majority of electronic book users preferred the ability to search within the text and across a collection of titles. Reading a complete text online was still difficult for many. Students wanted to be able to copy and print a single or multiple chapters of a work rather than the stiff page limits applied by many electronic book vendors.

Migration to Digital

After 29 years of existence, the Library acquired its millionth volume in September 2004. At that time, the Library had access to only 38,000 electronic books. By 2005, the Library grew to over 1,200,000 volumes, largely due to the acquisition of electronic books.

Because of the stable budget, the collection is expanding on all levels. In addition to adding significant collections in electronic format, the annual purchase of 15,000 to

18,000 monographic volumes adds to the quality of the collections. Media acquisition constitutes another growth area.

Despite the fact that the budget for monographs is increasing, the use of the print book collection continues to decline. Over the past two years, the checkout rate of the materials from the circulating collection declined. In 2003, 78,000 books were checked out. In 2005, 63,823 volumes were checked out, a 19% decline in 2 years. This statistic is in direct contrast to increases in the use of electronic books. With a collection of over 400,000 ebooks, the critical mass of materials is providing customers with an alternative to print books. In comparison, the average monthly number of downloads from electronic books went from 3,025 in 2004 to 6,559 in 2005

Most of the e-book collections provide a means for the customers to read and print pages from the work as well as search for words or phrases within a collection of books. These features as well as the ability to use the materials from outside the Library provide many customers with an alternative to visiting the building. While many find reading a book on a computer screen difficult and unnatural, others like the convenience. The use of the e-books is hard to relate to the use of print. What is apparent from the statistics is that the usage of e-books is rising exponentially as an additional source of information.

At present, only 300 periodical titles are received in paper format while 37,000 journals are received electronically. The print archive of 101,914 volumes remains a viable source for journal articles, but is used less than 10,000 times per year. In comparison, there were 495,000 downloads for articles from the electronic journals in 2005. The majority of print periodical usage is for titles that are not available electronically or for older volumes have not been converted to digital format. As funds are available, the Library continues to replace older, incomplete journals with their electronic equivalents. The one exception to this practice is for journals covering fine art where the quality of reproductions is often superior to the online version. Art journals are retained in paper format.

The Library provides access to online journals through direct subscriptions, from consortial purchases, and from aggregated database content. Because the consortial agreements often include access to the journals purchased by four medical schools (University of Texas—Galveston, Houston, Dallas, Tyler), the journals available in biology, health, chemistry, and nursing are

extensive. What is equally surprising is that the usage of specific journals would never have been anticipated in the non-digital library. For example, by reviewing the electronic article downloads in 2005 for ScienceDirect (Elsevier), only 3 of the top 10 journals were subscribed to in print. The others were titles received through the consortial agreements.

While the Library has not reached the depth of most major research institutions, the collections are expanding to levels never imagined in the recent past. Because of the changes in publishing and delivery, the Library seized other opportunities to support research besides the acquisition of materials.

Moving Out of the Box

The Library continues to expand its support of the research and learning missions of the University. One example is the use of technology to teach students search strategies and methods to evaluate information, the librarians are creating web-based tutorials that incorporate audio and video components. The creation of tutorials provides a way to instruct distance learners who are often unable to participate in classroom sessions held on campus.

Another strategy was to expose the Library staff to the research being conducted on campus. A lecture series was created and individual faculty members were selected to speak and describe their research. At times, the researcher also demonstrated their use of library resources or showed how the organization supported their work. Given the broad nature of the University, the library professionals and staff were exposed to the work of dozens of faculty members. During 2004 and 2005, the programs highlighted departments celebrating their 30th anniversaries. Another element of the lecture series is planned for the fall semester of 2006, but will showcase the University's authors through a reception and book signing.

Faculty research was also supported through the purchase of their publications. In addition to acquiring their books, the Library subscribed to all journals edited by faculty members.

Building the digital library required the incorporation of new formats and services. The demands for support of quantitative research from the Schools of Management and Social Sciences created an opportunity. Because of the analytical nature of research, the faculty members needed access to standard financial datasets on companies, executive compensation, and business

activity, as well as statistics on domestic and global economics. For faculty to compete with the research conducted at elite institutions, the datasets were essential. The acquisition of datasets has grown exponentially and is now about 10% of the budget for digital resources. Within the past year, the Library had an opportunity to hire a data librarian who supports is able to determine if the Library has access to particular types of statistics and facilitates the use of this information.

Several studies were conducted that ranked the University of Texas at Dallas School of Management. The School's Center for Information Technology and Management (CITM) conducted a study of the research productivity of the top 100 business schools in the world based on publication in a core set of management periodicals. The UTD School of Management ranked 33rd in North America from 2001-2005 and 36th worldwide [1].

In 2006, U.S. News and World Report ranked the School's Management Information Systems program as 24th in the United States, tied with Harvard University, and 16th among programs in public universities [2]. Finally, in 2002, the Institute for Operations Research and Management Sciences (INFORMS) ranked the School 6th worldwide in management science and information systems research productivity from 1997-2002 [3].

The University depends on receiving research dollars to support research in natural sciences and engineering. According to *Research Expenditures, September 2003-August 2004*, U.T. Dallas ranks 6th in Texas for research expenditures among public universities [4]. But, finding funding opportunities is critical. In an effort to support research, the Library subscribed to the Spin Plus database created by InfoEd International. The database provides timely access to information about grants and any researcher can setup a search to provide electronic mail delivery of grant announcements in specific subjects. In addition, the librarians have worked directly with the University's Office of Research Administration to promote the combined services of the departments and to train the faculty and researchers about proposal writing and finding grants.

The building of an institutional repository is one of the ultimate ways of delivering a digital archive of the research conducted at a University. The repository contains a digital copy of the University's dissertations and theses as well as articles from journals, reproductions of artwork, fictional works, and ultimately audio and video recordings. As each of the items is

indexed on an Internet search engine, the research is more likely to be found and quoted so it increases the possibility of the work being cited within the appropriate literature. The repository has the potential of bringing recognition to the University. While the repository is only in the beginning stages of development, it has already been promoted by a number of college deans.

The Library is currently exploring ways to scan resources owned in paper and deliver them digitally through Interlibrary Loan Services. This new level of service is projected to make the faculty members more efficient.

Finally, the Library opened a satellite facility in the School of Management to enable the librarian liaisons to work with more faculty members and students. The facility contains no books and was equipped with a few computers. It is open about 10-12 hours per week. The location of the facility was critical to its success and marketing was required to promote its use.

Many of these opportunities have enabled the Library to support research through expanding the services offered to faculty members. While librarians are not directly involved with the research, their support is making the faculty competitive with their peers at other institutions and more efficient in gathering information to support their projects.

Conclusion

Visually, the Library remains much the same as many traditional libraries. It has 3 miles of shelving, thousands of books, and a lack of study space. But a visit is not complete without accessing a workstation as 99% of the journals are available electronically and e-books are providing access to knowledge never owned in print. Every researcher has been impacted by the transition and most seem to favor the digital format for the delivery of information. A Library that was restricted by a limited budget has flourished by stabilizing a poor financial situation and by taking advantage of electronic resources.

Research at the University has improved during the transition and the Library has tried to make the delivery of information as seamless as possible by enabling access to most digital resources over the Web. In addition, the acquisition of quantitative datasets and special databases have wedded the Library to research.

While the transition is not complete, the impact of simply surfing the web rather than visiting the Library for information complicates the creation of a digital library. In an effort to promote the use of the electronic

materials, the Library recently registered online content with Google Scholar.

The demand for printed resources is not gone, but the ability to create a blended model of information delivery now meets the needs of most of our researchers. While this case study is not unique, it illustrates how the new model of delivery of information and resources is providing a wealth of materials for research never imagined in the recent past.

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If so, read *Designed for Digital: How to Architect Your Business for Sustained Success*, the new MIT Press book by Jeanne W. Ross, Cynthia M. Beath, and Martin Mocker. "The Enterprisers Project". One of Forbes's Top Ten Technology Books of 2019. About the Author. Jeanne W. Ross is Principal Research Scientist at the MIT Sloan Center for Information Systems Research. How to define and build the Digital Transformation Building Blocks required for a Digital transformation, a full framework with case studies. Perfect book for all the Digital and Enterprise architects looking for analyze, define and build the Digital Platform building blocks. It will help them less to understand how to create the technology systems to support the business architecture. Read more. The qualitative research methods of data collection does not involve the collection of data that involves numbers or a need to be deduced through a mathematical calculation, rather it is based on the non-quantifiable elements like the feeling or emotion of the researcher. An example of such a method is an open-ended questionnaire. To support a need for a new idea, change and/or innovation. To prove the need for a change in the norm or the introduction of new information that will be widely accepted, it is important to collect data as evidence to support these claims. What is a Data Collection Tool? Mostly designed for statistical analysis of the responses, they can also be used as a form of data collection. Purpose This article presents a recent research and development experiment on benefits analysis for adopting building information modeling/management (BIM) systems in megaproject delivery across work stages with regard to the needs of project stakeholders. It focuses on a new approach to benefits prioritization to support decision making against major challenges in megaproject delivery. Methodology The study was underpinned by an extensive literature review on relevant research and practices across the world, and a questionnaire-based survey on the benefits from adopting BIM in megaproject delive... It focuses on a new approach to benefits prioritization to support decision making against major challenges in megaproject delivery. Benefits companies expect platforms to deliver. Regardless of how far along they are in platform adoption, most companies see platforms as key to advancing growth-oriented initiatives (Figure 6). Applications built on a digital platform change and evolve rapidly. An open, modular architecture that promotes scale, as well as the reuse of a common set of functions built on standards-based services, enables a company to keep pace with new technologies and changes in ecosystem demands. New platforms also will emerge to support the monetization of the data generated by the billions of connected devices in operation around the world. These data marketplaces will unite buyers and sellers to unlock the value in IoT data assets.