

Developing Technologically Enhanced Learning Spaces for New Millennia Academic Libraries

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Abstract:

As a third place of community and learning, university academic libraries are shifting from quiet study spaces for reflection and inspiration to spaces of creation, technology and interdisciplinarity. Information technologies, media technologies and learning technologies are rapidly expanding in academic libraries. Spaces such as digital media centers, digitization and 3D printing labs, and technology-centric digital literacy classrooms are now regular features in university libraries. Makerspaces and research data visualization walls have also become more common. These new types of integrated social and technology enhanced spaces enable new forms of literacy (digital, algorithmic, information-based) and learning for wider communities. This research overviews considerations and conceptual ideas towards envisioning and creating these types of spaces in our new millennia. It utilizes material from early-stage and completed projects to discuss conceptual synthetic ideas for development. Challenges of possibilities for integrating existing traditional library spaces in an existing structure with new spaces of technology will be discussed. Innovative antecedent and recent models of current technology enhanced learning commons including Texas State University Libraries (2014-2020), the University of West Florida (2011, Skylab), University of Miami Information Commons (2006) and early-stage projects (Mississippi State University, 2023) are referenced to reflect on new technology/architectural possibilities. Challenges towards reconfiguring the 20th century classroom towards 21st century learning technology possibilities are reflected upon. Pragmatic realities and visionary necessities of creative re-envisioning spaces will be emphasized to better create technologically enhanced libraries suitable for the 21st century.

Keywords: academic libraries, architectural spaces, information technology, digital literacy, innovation



University of Miami Library Information Commons (2003),
Architectural Rendering



Texas State University Learning Commons (2023), Photograph

Introduction

The need for enhanced information technology spaces and library architectural redesigns present new opportunities for academic libraries in the new millennia. Through technological reimagining of library spaces, new digital and algorithmic literacy infrastructures for the 21st century are enabled. This ranges from possibilities with AI, data and immersive technologies to new algorithmic and digital literacy labs requiring better learning enabled architectures.

This research pragmatically focuses on four US academic research and teaching university libraries which highlight possibilities for building these new types of spaces: University of West Florida, John C Pace Library, Texas State University, Albert Alkek Library, University of Miami, Otto Richter Library and Mississippi State University Margaret Mitchell Memorial Library. This article highlights best practices and lessons learned from work and reflections over a twenty year period on small, medium, large and x-large, leading-edge, technologically enhanced library architectural projects (See Uzwyshyn, References 2003-2023). This ranges from very large multi-year projects (Texas State Learning Commons, 2014-2021) to medium size technology enhanced floor redesigns (University of West Florida Skylab, 2006-2010) to new larger projects currently in early developmental phases (Mississippi State Library Transformation, 2023). The work here also glances at early information commons (University of Miami Information Commons, 2003) and consistent threads to help future brainstorming and digital literacy. It emphasizes the need for imagination and imagineering technologically enhanced projects and spaces. This work in this way reflects on technology's path forward through a look back and forward view to the future of academic libraries to suggest pragmatic paths and visionary possibilities in creating new architectural spaces with new technologies for libraries.

In Media Res: The University of West Florida Skylab (2006-2010)



University of West Florida 20th Century Library Classroom



University of West Florida 21st Century Skylab Information Literacy Lab/Classroom

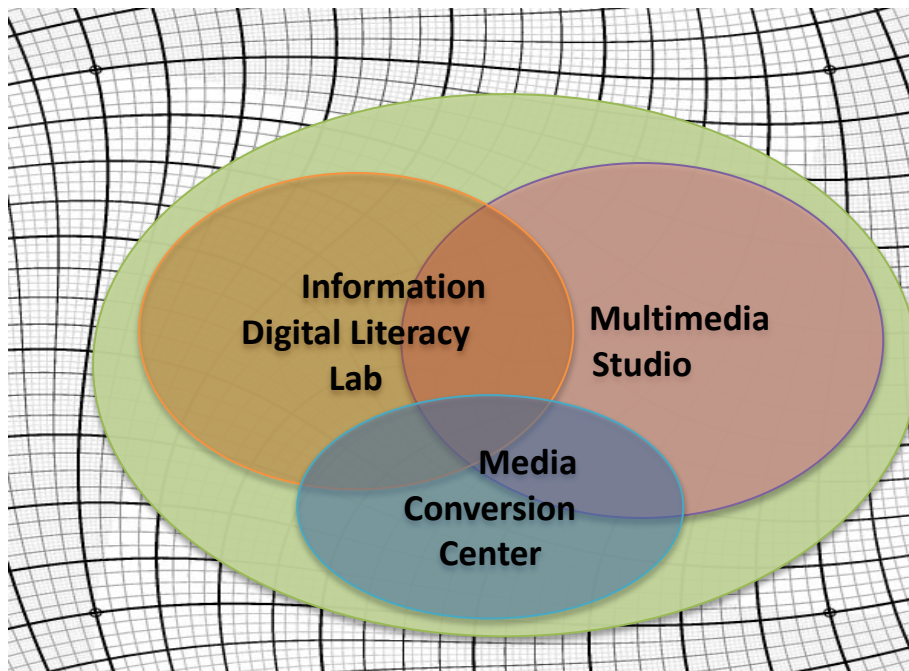
Perhaps it is best to introduce the topic of ‘technology-enhanced spaces in libraries’ as ‘*In Media Res*’ or the historical middle of a narrative through the unifying theme of libraries and literacy. What does it mean for a person to be literate in the 21st century? Simply put, it means an educated literate person in our new millennia must be digitally literate. They must be able to use the necessary tools to write, read and communicate globally on the web through a variety of media formats and tools. The University of West Florida Skylab (envisioned in 2006, completed 2010) conceptualizes this project. Skylab was an approximately 1M dollar USD project to take back the John C. Pace’s library’s fifth floor from university administration. The space rearticulates an outdated 20th century classroom and library structure to reclaim a new digital literacy definition as a technology enhanced library learning center and information literacy lab. Here, the Skylab envisioned a tripartite technologically enhanced redesign of the library fifth floor (Uzwysyn, Envisioning, 2010). This consisted of an information literacy classroom lab, multimedia digital literacy studio and digital literacy and media conversion center for students and faculty. While the old classroom consisted of a Cartesian grid-like structure, more suitable to the industrial revolution of the 19th and early 20th centuries, the new space focused on commingling group study, technology rich areas and a rearticulation of the classroom through technological possibility. Key differences in this type of space sought to spatially rearticulate new areas and thought regarding learning and literacy needs. This included new teaching methodologies, classroom settings, teaching roles, resources, and technology possibilities. It also included new special ideas regarding collaboration, engagement, technological skills, and new learning space requirements. These new spaces sought to efface 19th century industrial revolution parallels. This included a larger paradigm shift, from rote learning and a lectern at the front, to active learning. Spatially, there was a replacement of the previous uniform grid like Cartesian rows of desk classroom to more flexible and varied layouts to promote collaboration and adaptability and integration of an abundance of advanced technologies. This shift also involved new conceptual ideas of student engagement. Student roles had changed from passive receptacles of information to active student engagement via participatory learning technologies. The teacher no longer stood at the front as a primary source of authority but was now a more decentered but important assistive guide and facilitator. Necessary skill levels also shifted and increased from basic reading, writing and research to digital, algorithmic and database search literacy and suitable associated

modalities. (See Table One below for further detailed comparison).

Characteristics of Learning Spaces	19th Century Classroom (1st Industrial Revolution)	21st Century Classroom (4th Industrial Revolution)
Learning Methodology	Rote learning, focused on memorization and repetition.	Active learning, emphasizing creativity, critical thinking skills.
Classroom Setting	Uniform grid-like Cartesian rows of desks, with teacher at the front; "one-size-fits-all" approach.	Flexible and varied layouts that promote collaboration, adaptability and personalized learning environments.
Teaching Role	Teacher-centered instruction, with teachers as the primary information source.	Student-centered instruction, with teachers as assistive guides and facilitators.
Resource Availability	Limited resources - primarily textbooks and physical materials.	Abundance of resources - digital e-textbooks, online materials, multimedia, OER and Open Access resources.
Technology Usage	Little to no technology in classrooms.	Integration of advanced technologies (laptops/tablets, phones, learning management systems, online libraries, digital whiteboards, multimedia, interactive technologies)
Collaboration	Individual-focused tasks and desks, limited group work.	Emphasis on teamwork, collaborative projects, online global classroom collaborations.
Student Engagement	Passive receipt of information, limited student engagement.	Active student engagement via interactive, participatory and personalized learning technologies.
Access to Information	Limited access to information, confined to school hours and physical materials.	Anytime, anywhere access to information large bandwidth digital connectivity.
Skills Emphasis	Focus on basic literacy and numerical skills.	Emphasis on 21st century digital and algorithmic literacy, creativity, critical thinking, problem-solving, communication, collaboration.
Learning Pace	Uniform pace of instruction for all students.	Personalized learning pace, enabled by adaptive learning technologies.

Table 1: Factor and Characteristics Comparison and Contrast of 19th and 21st Century Classroom and Academic Library Learning Spaces

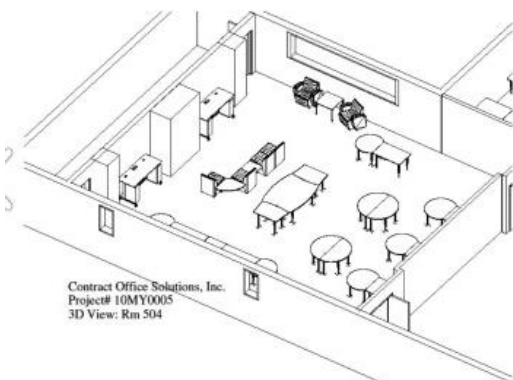
Intersectional Spaces, Innovative Technology, Interdisciplinary Learning & Research



Rearticulating the 20th Century Cartesian Library Classroom Grid with Faculty and Student Interdisciplinarity and Enhanced Technological Intersections

The University of West Florida Skylab reimagined the 19th century space of learning in terms of enhanced technology possibilities for the classroom. It also rearticulated the libraries third social space in terms of digital literacy. This reclaims a Gutenberg type role for the library and renaissance set of possibilities for digital literacy as the intersections of a broad cross fertilization of projects, people, tools and skillsets. This was also a first move towards 4th industrial revolution ideas. It reflected our new millennia era’s rapid technology changes in societal patterns, social processes, and new possibilities for areas, ranging from interconnectivity, learning to technology, and putting forward the academic library in its best light. The Skylab included a multimedia studio, digital literacy classroom and media conversion center and associated services.

Information Literacy Classroom



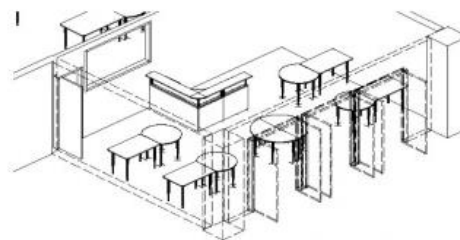
Contract Office Solutions, Inc.
Project# 10MY0005
3D View: Rm 504

Evolutionary Design Process

Various Technologically Enhanced Spaces For Learning & Collaboration Guided By Technology Possibilities:

Comfortable Seating, Mobile Desks, Enhanced Electrical/Data Ports Non Traditional Classroom Capabilities

MULTIMEDIA STUDIO & MEDIA CONVERSION CENTER



Contract Office Solutions, Inc.
Project# 10MY0005
3D View: Rm 519



Open Permeable Boundaries Between Studio, Conversion Center and Classroom, Open Office For Skylab Manager

MEDIA CONVERSION CENTER TWO TIERS OF SERVICES ENABLED

Format Conversion
Audio/Video Analog to Digital
Oral History Projects
Video History Projects
Public History
Special Collections Projects
Online Digital Archives



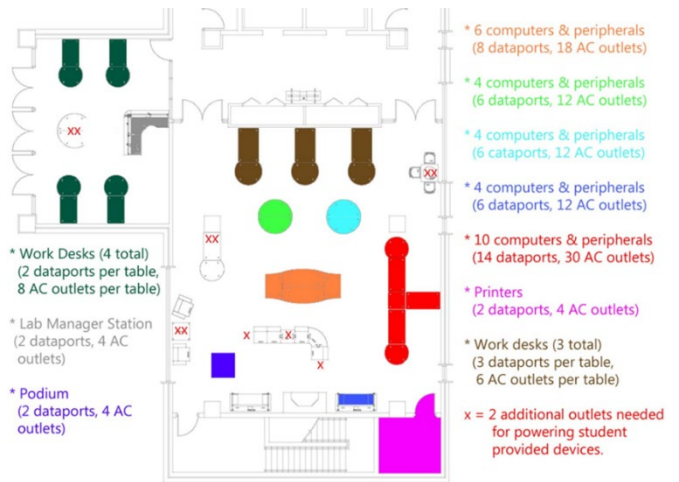
MEDIA CONVERSION CENTER

Hardware & Software Main Components

Cassette to MP3 Conversion Hardware
VHS to DVD Conversion Hardware
Multimedia port enhanced PC
TB Hard drives for Storage
Large Format (11x17) Scanner with
Slide/Negative Capabilities
Headphones &
Audio Conversion Software (Audition)
Video Conversion/Editing Software (Vegas)



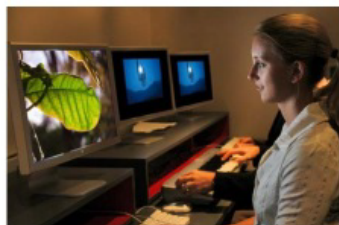
School of Athens, Raphael,
Renaissance Models of Interdisciplinary Learning



Skylab, Enhanced Classroom Data and Electrical Needs

MULTIMEDIA STUDIO SERVICES ENABLED

Image Editing
Scanning Assistance
CD/DVD Creation
Digital Audio/Video Capacity
Podcasting
Website Creation and Design
Multimedia Website
Specialized Student Digital Literacy Projects



Keyword for 21st Century Libraries: **Digital Literacy**

MULTIMEDIA STUDIO

Main Equipment Components (Hardware & Software)

2 Multimedia Macs with Dual Monitors
Digital Camcorders
Digital Cameras
Flatbed Slide Scanners
Adobe Creative Suite 5 (Suite of Software)
Apple Final Cut Pro (Digital Video)

Total \$32,18.00



Texas State University Learning Commons and Alkek One (2014-2021)






Albert Alkek Library, Texas State University

The Texas State University Learning Commons and Enhanced Technology Transformation expanded and continued these ideas. This very large project occurred over a seven year period (2014-2021) transforming TXU's Alkek Library from a 20th century hieroglyph (a vast book warehouse academic library model) to a 21st century multi-tiered Learning Commons refocused on new millennia student success and new faculty research and teaching possibilities. Texas State University was a Carnegie Class R2 Doctoral University of approximately 40,000 students and faculty and focused on higher research activity. This multi-year and multi-stakeholder project involved building on previous University of West Florida ideas. A full decade later, with more mature technologies, there was wider acceptance of a broad spectrum of enhanced multimodal technologies with more possibilities for interdisciplinarity ([Video Tour](#), 2020). The eventual 40M USD project consisted of 3-5 multi-year planning and build phases. These involved architectural programming, design, technological implementation, and many voices. For brevity's sake, this XL large 40 M USD project may be divided into three larger phases.

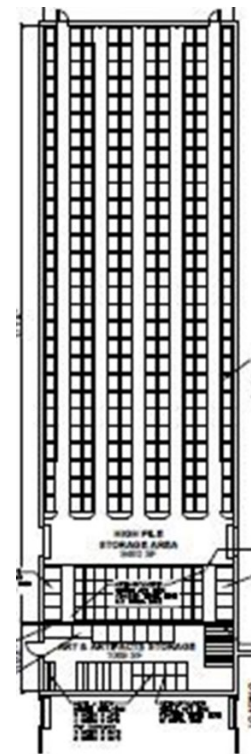
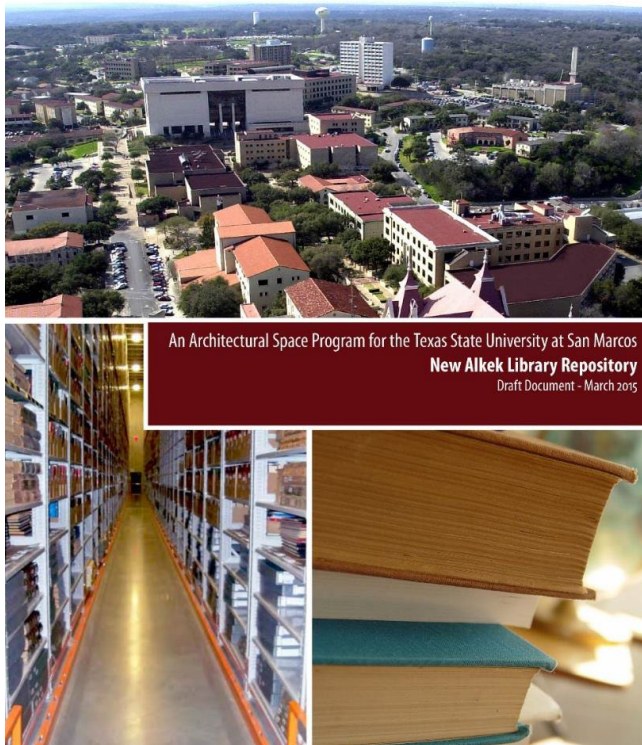
- **Phase I:** Infrastructure Upgrade: Electrical/Data, 2014-2017. 5M
- **Phase II:** Mid-Term Learning Commons/Library Transformation of Spaces/Floors: Furniture/Special Collections, Offsite-Repository (ARC)/1M Books Moved, 2016-2019. 10M
- **Phase III:** Alkek I, Future Learning Spaces/Themed Centers, 1st Floor Technology, Immersion Studio (VR), GIS Lab, Makerspace, Smart Classrooms/Digital Media Labs/Studios (2018-2020). 25M

Before going into any larger project like this, a few caveats and generalizations are in order. These involve design parameters/constraints for this type of larger space-enhanced technology project. Before going into any project of this size, larger facets, regarding project management, should be closely examined. Major considerations include: budgetary allowances, university administrative directions, donor possibilities and human resource requirements. Staff, stakeholder/university interests, library and university work culture, social factors and current and future library needs should all be reflected on carefully. Planning principles regarding technology enhanced learning spaces should be adhered to in

larger aspects. The most important of these, in the author’s 20-year experience, is that *‘technologies deployed in academic libraries in the 21st century will change over time. Planning should reflect this by allocating appropriate space without necessarily establishing a specific technology for each space’*. In this regard, it’s wise to glance back retrospectively at conceptual changes for library learning spaces and technology in the past twenty-five years and new millennia, roughly 2000-2024 moving forward.

Library Commons General Developmental Periods	Historical Space/Technology Conceptual Changes in 21st Century Library Learning Commons
<p data-bbox="172 645 481 705">2000-2000, Early PC Phase Information Commons</p> 	<p data-bbox="598 629 1125 658">Initial Information Commons Adoption Phase</p> <ul style="list-style-type: none"> <li data-bbox="512 674 1461 741">- Libraries are still primarily viewed as physical repositories of books and materials (Book Warehouse Phase). <li data-bbox="512 763 1422 831">- Initial integration of technology: PC’s and online databases begin to complement and displace traditional print resources. <li data-bbox="512 853 1390 920">- Onset of information commons, higher speed network throughput, connectivity, Wi-Fi enabled spaces allow users to use their own devices. <li data-bbox="587 931 1501 960">- Early adoption of online e-books and digital media database content occurs. <li data-bbox="587 987 1294 1016">- Innovative libraries start experimenting with makerspaces.
<p data-bbox="161 1086 493 1146">2010-2020, Digital and Cloud Integration Phase</p> 	<p data-bbox="587 1041 1374 1070">Transition to Learning Commons, Digital Integration Phase, Ver 1.0</p> <ul style="list-style-type: none"> <li data-bbox="512 1086 1461 1153">- Rapid proliferation of mobile technologies, increased demand for digital content, Wi-Fi bandwidth continues to increase. <li data-bbox="512 1176 1513 1243">- Libraries adopt more technology, self-service kiosks, digital repositories, 3D printing lab. The library becomes the university’s largest computing lab. <li data-bbox="512 1265 1517 1332">- E-books, online journals, and digital databases become dominant. Books and bound journals begin to be moved out. <li data-bbox="512 1355 1497 1422">- Libraries transform into collaborative student/faculty digitally enabled learning spaces. Areas for group study, digital collaboration, research and learning. <li data-bbox="512 1444 1501 1512">- Introduction of widespread digital and data literacy programs, data research repositories, technology training workshops, micro-credentialling.
<p data-bbox="156 1534 311 1563">2019-2023+</p> 	<p data-bbox="587 1489 1273 1518">Digital Transformation Expansion Phase – Learning Spaces</p> <ul style="list-style-type: none"> <li data-bbox="512 1534 1509 1601">- Mobile, digital, media and communications technologies become ubiquitous, reshaping libraries into multidimensional learning commons. <li data-bbox="587 1624 1485 1691">- Complete acceptance of BYOD (Bring Your Own Device) culture. Libraries provide charging stations, digital resources, and robust Wi-Fi. <li data-bbox="571 1713 1517 1780">- Almost complete shift towards cloud-based resources and media for storage and access to cloud-based digital materials is seen. <li data-bbox="512 1803 1485 1870">- New integration with emerging technology: AI, AR/VR/XR labs, IoT, data research repositories and associated library ‘help’ services begin. <li data-bbox="512 1892 1513 1960">- Libraries increasingly integrate makerspaces, digital media labs, data, digital and algorithmic literacy learning and innovation centers for faculty and students.

From Book Warehouse to Learning Commons



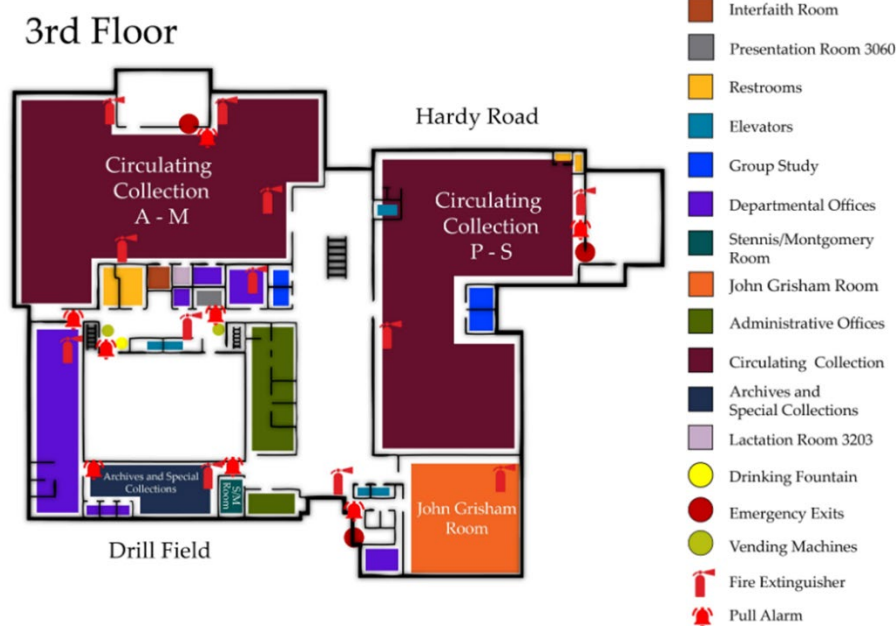
Texas State Offsite Repository Preliminary Planning Documents, 2015

In transforming any academic library book warehouse to a technologically enabled 21st century learning commons, large questions arise. First among them is what is to be done with the books and material holdings (i.e., bound journals, media, special collections archives)? How do we also best make room for new spaces needed for a technology and patron-centered learning commons? These larger challenges may be handled in many innovative ways. For Texas State University, in 2015, the solution was to build an offsite repository (10M USD) or, as it was later named, the ARC (Archival Research Center). This involved moving approximately one million of the four million monograph and the bound journal collections. Space will be needed for the makerspaces, digital studios, technology enabled study spaces and digital literacy labs. This will also require moving previously filled library stacks and, simultaneously, installing efficient information control structures regarding offsite inventory for these pathways and patrons who need these materials.



Texas State Offsite Archival Research Center, 2017

Other Space Enabling Possibilities – Digital Resources and Backfiles



Third Floor, Mississippi State University Library, Circulating Collections, A-S

If building an offsite repository is not currently feasible in making room for new technologically enhanced spaces, there are also other possibilities. Monographic collections may be moved to other areas of the library while simultaneously converting unused larger bound journal collections to digital media to reside in the cloud. In early learning commons planning at Margaret Mitchell Library Mississippi State (2023), digital backfiles were purchased from the large historical research backfiles possibilities ranging from the Institute of Electrical and Electronics Engineering (IEEE) to JSTOR. Other very large historical journal storage digital archives covering large swathes of leading academic journals from STEM disciplines to the social sciences and humanities are increasingly available. Hathi Trust memberships may also be obtained for electronic borrowing as largely unused bound journal stacks are repurposed. Search preference modalities for academics working in the 21st century on article-based research weigh towards the database and instant search rather than muddling through stacks. These subscription, cloud-based possibilities may also be combined with space planning to affect larger innovative possibility.



Mitchell Memorial Library, Five Floors, 70,000 sq. ft.

Final Notes: Funding, Donors, New Models and Vision



U Miami Commons 2003 Donor
Architectural Renderings

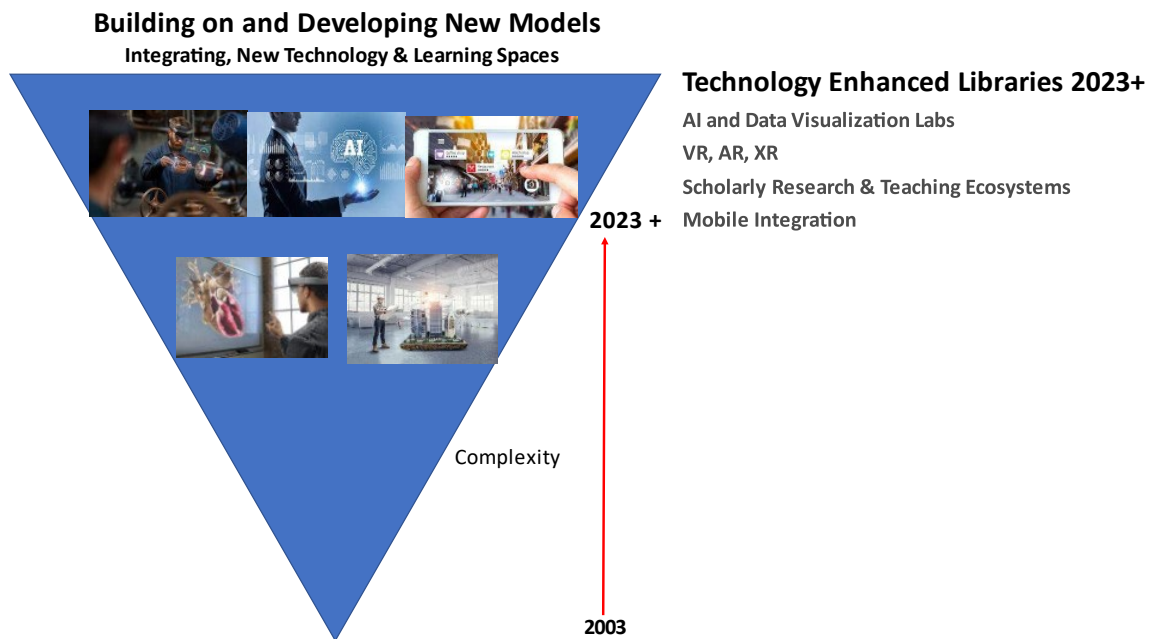


Mississippi State University Donor Adobe Firefly 2023
Generative AI Photographic Digitization Lab Visualizations

Funding and donors will be needed in building any new technologically enhanced library space. Whether this comes from university, state, national appropriations, or an interested donor or set of donors, a vision of the future and possibilities should be set. As much as possible, spaces should be more precisely described to gain funding. This new space planning begins with the ability to imagine, reimagine, and set a vision for these new spaces through images and text. These aspirational and inspirational plans are then circulated widely through documents to prospective funders and stakeholders. Twenty years ago, this was done with architectural renderings and documents. Today, we have all kinds of generative AI multimedia tools that can help us envision the future so libraries can better first interest donors and then begin to partner with architects and engineers to reify projects and realize dreams.

In 2023, technology enhanced academic libraries consist of new possibilities for scholarly research, teaching ecosystems and mobile integration. We are building the future. We are also extending and integrating new technology and learning spaces with historical ideas of literacy. This now includes information, digital and algorithmic literacy. This core thematic literacy function in many historical variations has always been the library's unique role. The

focus should remain for learning, research, and the continued forward progress of knowledge.



Acknowledgments

Developing these types of technology enhanced learning spaces is always a larger group effort, often occurring over many years. The author gratefully acknowledges the multitude of library, university staff, faculty architects, engineers, and university IT with whom he has worked with over the years on all these projects. This includes the various library faculties and professional staffs at University of Miami Libraries, Otto Richter Library, University of West Florida John C. Pace Library for the Skylab, Texas State University Libraries and Mississippi State University Libraries.

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