

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 labs 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 larger 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 19th century classroom grid towards 21st century learning technology possibilities are reflected upon. Pragmatic realities and visionary necessities of creative re-envisioning space possibilities 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 possibilities, 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 architectural spaces.

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 Uzwysyn, References 2003-2023) ranging 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 glances at early information commons (University of Miami Information Commons, 2003) and consistent threads of future brainstorming and digital literacy to emphasize the need for imagination and imagineering technologically enhanced projects and spaces. This work 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

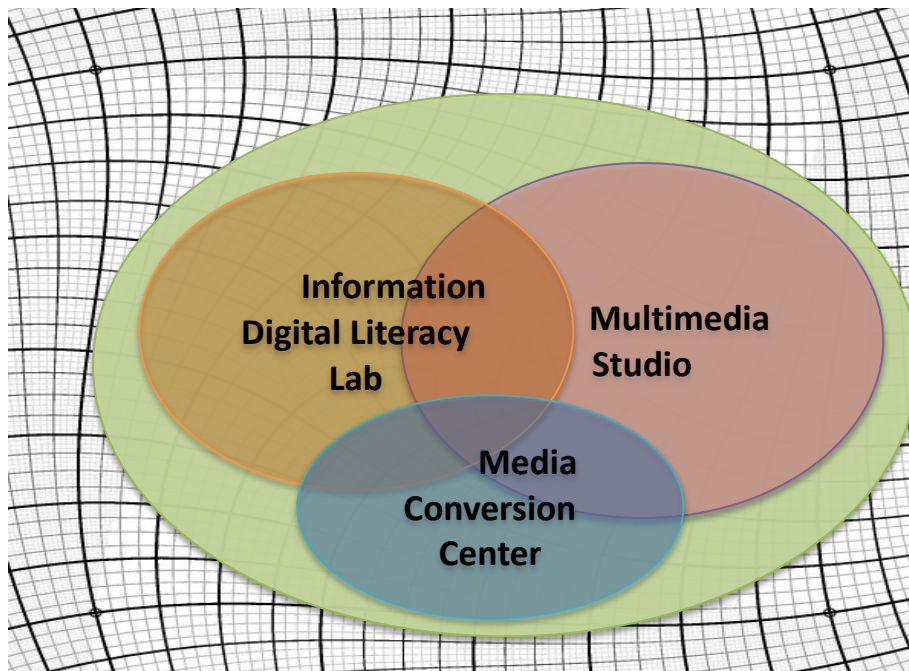
Perhaps it is best to introduce the topic of ‘technology-enhanced spaces in libraries’ as ‘*In Media Res*’ or the historical middle of a narrative through the unifying theme of libraries and literacy. What does it mean for a person to be literate in the 21st century? Simply put, it means an educated 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 digital 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 first industrial revolution of the 19th century, 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, resource, and technology possibilities. It also included new special ideas regarding collaboration, the need for engagement, technological skills, and new learning space requirements. The new space sought to efface 19th century first industrial revolution parallels. This included a larger shift, from rote learning from 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 required 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 guide and facilitator. Skills shifted from basic reading, writing and research to digital, algorithmic and database search literacies and suitable associated modalities. (See Table One below for further detailed

comparison, differences, and rearticulations).

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, and critical thinking skills.
Classroom Setting	Uniform grid-like Cartesian rows of desks, with teacher at the front; a "one-size-fits-all" approach.	Flexible and varied layouts that promote collaboration and adaptability; personalized learning environments.
Teaching Role	Teacher-centered instruction, with teachers as the primary source of information.	Student-centered instruction, with teachers as guides and facilitators.
Resource Availability	Limited resources - primarily textbooks and physical materials.	Abundance of resources - digital textbooks, online materials, multimedia resources.
Technology Usage	Little to no technology in classrooms.	Integration of advanced technologies (laptops/tablets, phones, learning management systems, online library catalogs digital whiteboards, multimedia enabled PC's).
Collaboration	Individual-focused tasks and desks, with limited group work.	Emphasis on teamwork and collaborative projects, both within and beyond the classroom (including global internet enabled collaborations).
Student Engagement	Passive receipt of information, limited student engagement.	Active student engagement via interactive and participatory learning technologies.
Access to Information	Limited access to information, confined to school hours and materials.	Anytime, anywhere access to information due to digital connectivity.
Skills Emphasis	Focus on basic literacy and numerical skills.	Emphasis on 21st century digital, information 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

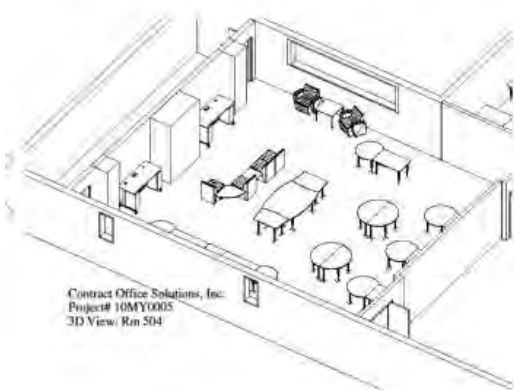
Intersectional Spaces, Innovative Technology, Interdisciplinary Learning & Research



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 but also rearticulated the libraries third social space in terms of digital literacy, reclaiming 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 class and media conversion center and associated services.

Information Literacy Classroom



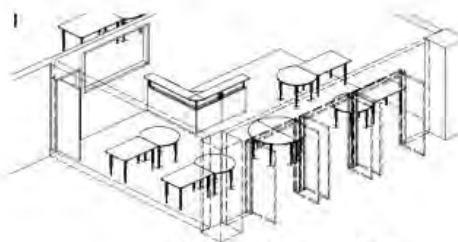
Contract Office Solutions, Inc.
Project# 10MY0005
3D View: Rm 504

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



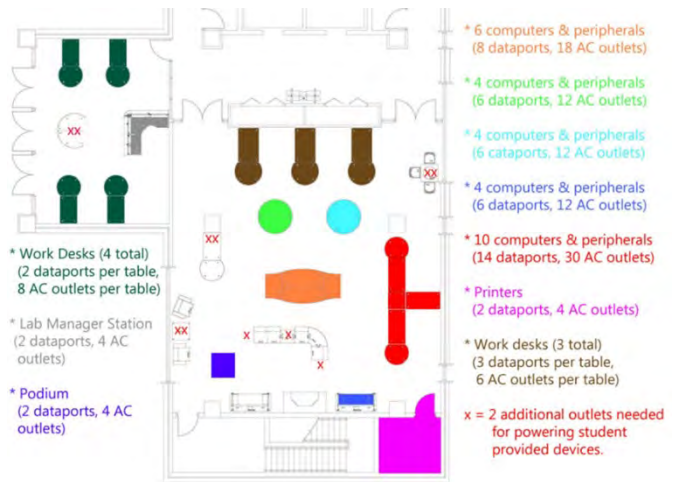
MEDIA CONVERSION CENTER

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 with a very large project which occurred over a seven year period (2014-2021) transforming TXU's Alkek Library from a hieroglyph for the 20th century (a vast book warehouse academic library model) to a 21st century multi-tiered Learning Commons refocused on student and faculty research and teaching success. 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 ideas from the University of West Florida. A full decade later, with more mature technologies, there was wider acceptance of a broader spectrum of enhanced technologies with more possibilities for interdisciplinarity ([Video Tour](#), 2020). The eventual 40M USD project consisted of 3-5 multi-year phases. These all involved architectural programming, design, technological implementation, and many voices. For brevity's sake, this XL larger 40 M USD project may be divided into three larger phases.

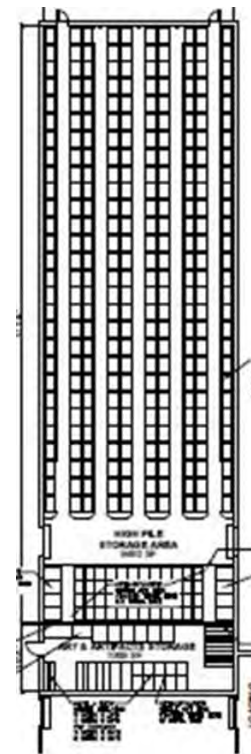
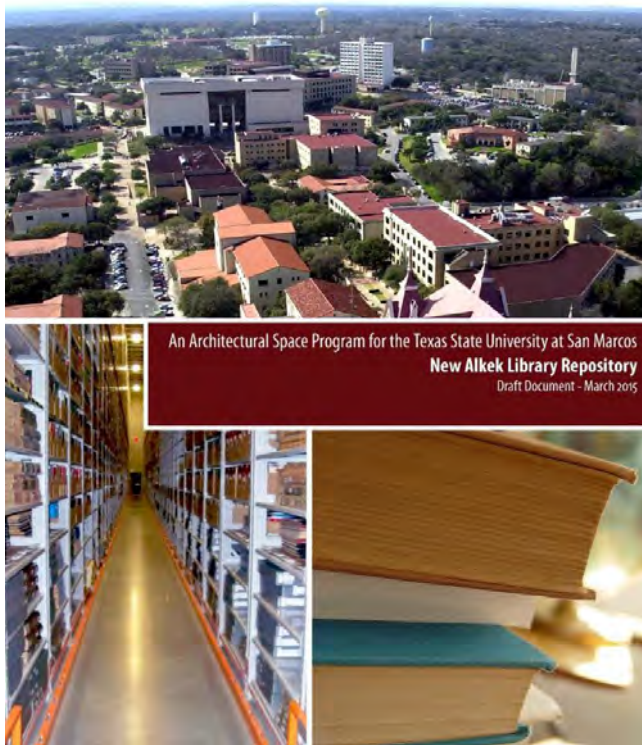
- **Phase I:** Infrastructure Upgrade: Electrical/Data; Off-Site Repository/1M Books, ARC, 2014-2017.
- **Phase II:** Mid-Term Learning Commons/Library Transformation of Spaces/Floors: Furniture/Special Collections, 2016-2019.
- **Phase III:** Alkek I, Future Learning Spaces/Themed Centers, 1st Floor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

Before going into any larger project like this, a few caveats and large generalizations are in order. These involve both design possibilities and 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 areas 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 considered. 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, perhaps it’s wise to glance back in retrospect at conceptual changes in library learning spaces and technology in the past twenty-five years and new millennia, roughly 2000-2023 going forward.

Alkek Library Commons Developmental Periods	Historical Space/Technology Conceptual Changes in 21st Century Library Learning Commons
<p data-bbox="76 636 437 707">2003-2012, Early PC Information Commons</p> 	<p data-bbox="596 627 906 663">Initial Adoption Phase</p> <ul style="list-style-type: none"> <li data-bbox="513 672 1461 743">- Libraries are still primarily viewed as physical repositories of books and materials. <li data-bbox="513 757 1420 828">- Initial integration of technology: PC’s and online databases begin to complement and then displace traditional resources. <li data-bbox="513 842 1433 913">- Onset of information commons, higher speed network throughput and connectivity and Wi-Fi enabled spaces allow users to use their own devices. <li data-bbox="587 927 1503 958">- Early adoption of online e-books and digital media database content occurs. <li data-bbox="587 981 1299 1012">- Innovative libraries start experimenting with makerspaces.
<p data-bbox="76 1084 459 1155">2013-2019, Digital and Cloud Integration Phase</p> 	<p data-bbox="590 1039 935 1075">Digital Integration Phase</p> <ul style="list-style-type: none"> <li data-bbox="513 1084 1461 1155">- Rapid proliferation of mobile technologies, increased demand for digital resources and Wi-Fi bandwidth continues to increase. <li data-bbox="513 1169 1513 1240">- Libraries adopt more technology, self-service kiosks, digital repositories, 3D printing lab and become the universities largest computing lab. <li data-bbox="513 1254 1471 1326">- E-books, online journals, and digital databases become dominant and the standard while the books and bound journals begin to be moved out. <li data-bbox="513 1339 1487 1411">- Libraries transform into collaborative student/faculty digitally enabled learning spaces, areas for group study, digital collaboration, research and learning. <li data-bbox="513 1424 1503 1496">- Introduction of widespread digital and data literacy programs, data research repositories and technology training workshops and micro-credentialling is seen.
<p data-bbox="153 1541 309 1576">2019-2023+</p> 	<p data-bbox="590 1487 999 1523">Digital Transformation Phase</p> <ul style="list-style-type: none"> <li data-bbox="513 1532 1455 1603">- Mobile, digital, media and communications technologies are ubiquitous, reshaping libraries into multidimensional learning commons. <li data-bbox="587 1617 1497 1688">- Complete acceptance of BYOD (Bring Your Own Device) culture, with libraries providing charging stations, digital resources, and robust Wi-Fi. <li data-bbox="587 1702 1519 1774">- Almost complete shift towards cloud-based resources and media for storage and access to cloud-based digital materials is seen. <li data-bbox="513 1787 1503 1859">- New integrations with emerging technologies like AI, AR/VR/XR labs, IoT, data research repositories and associated library ‘help’ services. <li data-bbox="513 1872 1493 1944">- Libraries increasingly serve as makerspaces, digital media labs, and digital and algorithmic literacy learning and innovation centers for faculty and students.

From Book Warehouse to Learning Commons



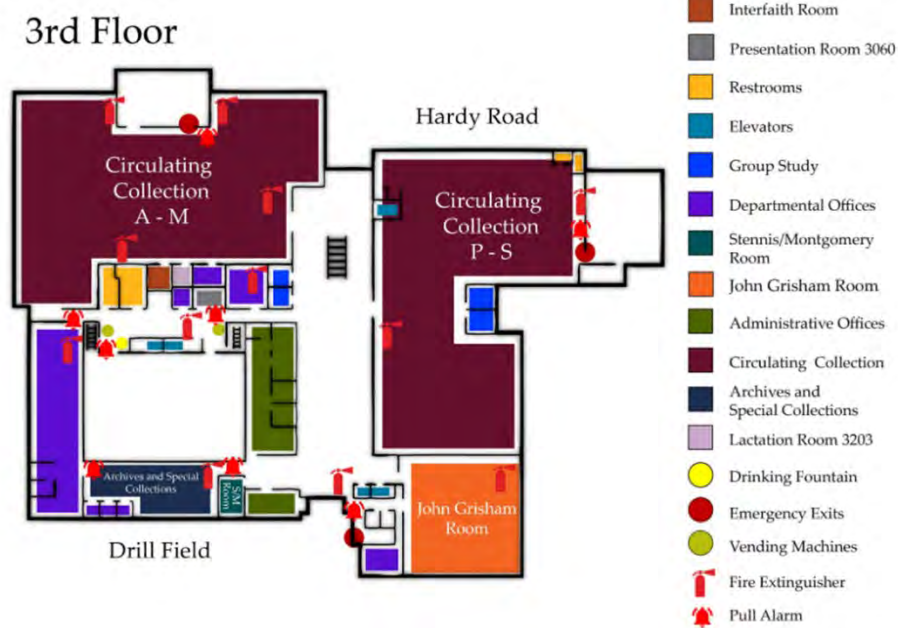
Texas State Offsite Repository Preliminary Planning Documents, 2015

In transforming any academic library book warehouse to a technologically enabled 21st century learning commons, larger 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 the new spaces needed for a technology and patron-centered learning commons? These larger challenges can 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 for converting largely unused ‘bound journal stacks’. Monographic collections may be moved to other areas of the library while simultaneously converting 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 are being purchased from the large historical backfiles possibilities ranging from the Institute of Electrical and Electronics Engineering (IEEE) to JSTOR. Both are very large historical journal storage digital archives covering large swathes of leading academic journals from STEM disciplines to the social sciences and humanities. 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.

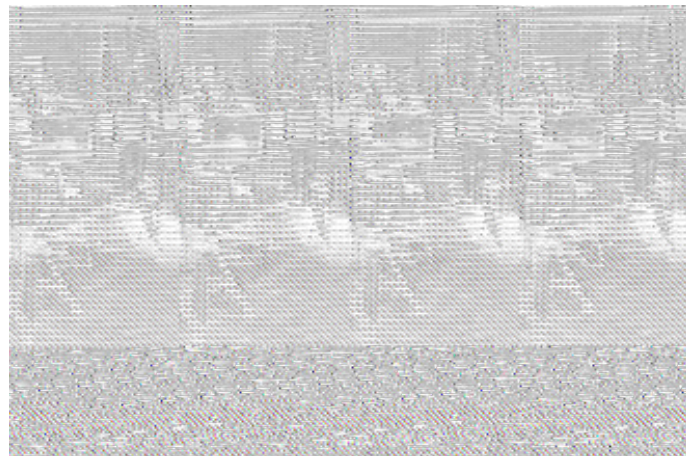


Mitchell Memorial Library, Five Floors, 70,000 sq. ft.

Final Notes: Funding, Donors, Vision, and New Models



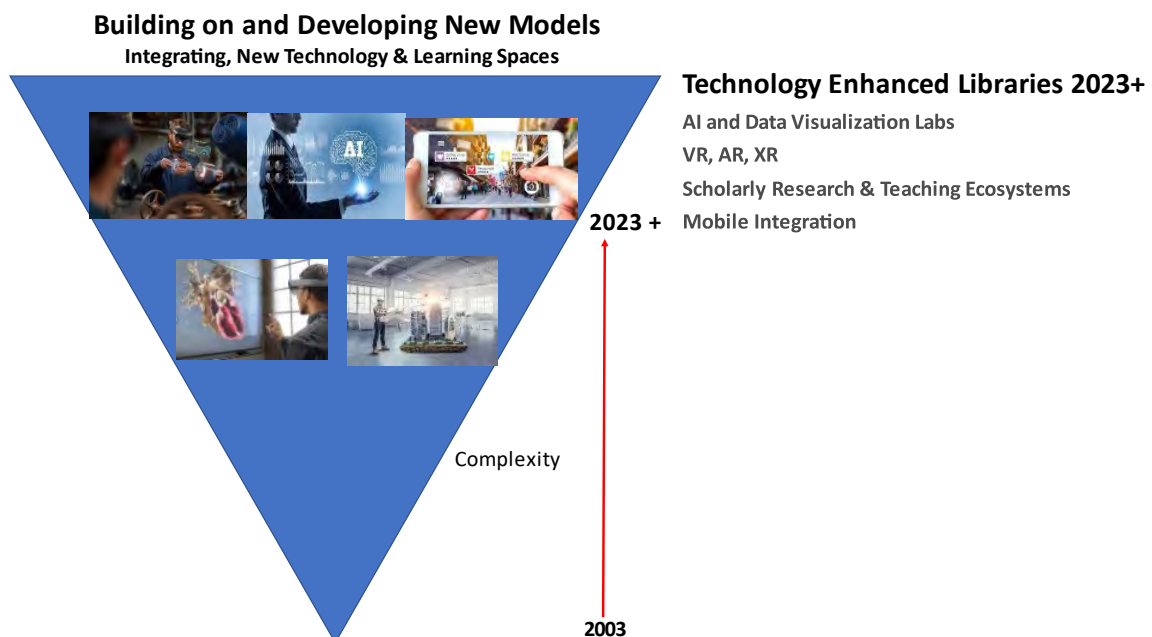
U Miami Commons 2003 Donor Architectural Renderings



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

In building any new technologically enhanced library space, funding and donors will be needed. Whether this comes from university, state or national appropriations, or an interested donor or set of donors, a vision of the future and possibilities should be set. As much as possible, this should be more precisely described to gain funding. This begins with both the circulation of documents and ability to imagine, reimagine, and set a vision through images and text. 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 partner with architects and engineers and interest donors.

In 2023, technology enhanced academic libraries consist of new possibilities for scholarly research, teaching ecosystems and mobile integration. We are building the future but also extending and integrating new technology and learning spaces with historical ideas of literacy inclusive of digital and algorithmic literacy. This has always been the library's unique role. The focus should remain so for learning, research, and the continued forward progress of knowledge.



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