

Innovation in University Libraries: Creating Spaces that Foster Academic Growth

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Abstract—University libraries have traditionally been the heart of academic institutions, serving as repositories of knowledge and hubs for student and faculty engagement. In recent years, significant innovations in library spaces and services have transformed these environments, enhancing their role in supporting academic success. This article explores the latest trends and innovations in university library design and services, emphasizing their impact on the academic landscape. Key areas of focus include the integration of technology, collaborative spaces, personalized services, and community engagement initiatives.

Index Terms—Library Space, Academic, University Libraries

I. INTRODUCTION

In recent years, university libraries have undergone a profound transformation, evolving from traditional repositories of books into dynamic, multifaceted environments that support a wide range of academic activities. This shift is driven by the increasing demand for spaces that foster collaboration, innovation, and creativity among students and faculty. As the landscape of higher education changes, so too must the libraries that support it, embracing new technologies and design principles to create spaces that meet the diverse needs of their users.

The concept of the library as a mere storage space for printed materials is rapidly becoming obsolete. Modern university libraries are now envisioned as vibrant hubs of academic life, where students can engage in collaborative learning, access cutting-edge technology, and find quiet spaces for deep reflection and study. This transformation is essential in fostering academic growth and ensuring that libraries remain relevant and valuable in the digital age.

The need for innovation in library spaces is underscored by the changing nature of information consumption and the growing emphasis on experiential learning. Today's students seek environments that are not only resource-rich but also flexible, adaptable, and conducive to a variety of learning styles and activities. By integrating features such as makerspaces, collaborative work areas, and digital media labs, libraries can provide the tools and spaces necessary for students to thrive academically.

This article explores the various ways in which university libraries are innovating their spaces to foster academic growth. It examines the underlying principles of modern library design, highlights successful examples of innovative library spaces, and discusses the impact of these changes on student learning and engagement. By understanding and embracing these innovations, university libraries can continue to play a crucial role in supporting the academic and personal development of their users.

II. NEED FOR INNOVATIVE LIBRARY SPACES

Innovative library spaces are essential for modern academic environments as they cater to the evolving needs of students and faculty. Here are some of the reasons highlighting the need for such spaces:

Changing Academic Needs: The academic landscape is evolving from a print-centric approach to digital and collaborative learning environments. Traditional libraries, focused primarily on print collections and individual study spaces, are no longer sufficient to meet the demands of modern education. The shift towards digital resources, online learning, and collaborative projects necessitates a transformation in library design and services. Libraries must evolve to support digital literacy, provide access to online databases, and facilitate group work and interdisciplinary collaboration. Libraries are incorporating digital labs, multimedia production studios, and interactive learning spaces to support the needs of students and faculty engaged in digital projects and research.

User Expectations: Students and faculty have increasing expectations for flexible, tech-enabled, and inclusive library spaces. Today's users expect libraries to offer more than just access to books. They seek flexible spaces that can adapt to various activities, from quiet study to lively group discussions. Technology plays a crucial role in this transformation, with users expecting seamless access to high-speed internet, digital tools, and resources that support their academic and research endeavours. Inclusivity is also paramount, with a need for spaces that are accessible and welcoming to all individuals, regardless of their physical abilities or learning preferences. Libraries are designing areas with movable furniture to accommodate different group sizes, installing high-speed Wi-Fi and charging stations, and ensuring facilities are accessible to people with disabilities. They also provide inclusive spaces like gender-neutral restrooms and prayer rooms to cater to diverse user needs.

Support for Diverse Learning Needs: Libraries serve a diverse student population with varying needs. Innovative spaces provide quiet zones for individual study, vibrant areas for group work, and specialized rooms for tutoring and workshops. This variety ensures that all students can find an environment that suits their study preferences and requirements.

Adapting to Evolving Roles of Libraries: The role of libraries has expanded from being mere repositories of books to becoming centers of learning, research, and innovation. Innovative library spaces reflect this transformation by providing resources and services that support academic and personal growth. This includes areas for career counselling, digital literacy training, and other support services.

III. OBJECTIVE OF THE STUDY

The following are the objectives of the Study:

- To investigate the latest trends and innovative practices in the design and services of university libraries.
- To analyse how these innovations impact student learning, engagement, and overall academic success.
- To study the role of advanced technologies in modernizing library spaces and enhancing user experience.
- To identify and evaluate design principles that contribute to creating dynamic and adaptable library environments.
- To present case studies of successful library transformations.
- To identify the challenges faced in modernizing library spaces and suggest practical solutions to overcome them.

IV. KEY CONCEPTS IN LIBRARY SPACE INNOVATION

The key concepts in library space innovation emphasize the creation of dynamic, adaptable, and inclusive environments that cater to the diverse needs of modern academic communities. Here are three major concepts with their descriptions, applications, and examples:

Concept 1 - Third Place Theory

Concept: Third Place Theory, introduced by sociologist Ray Oldenburg, refers to social surroundings separate from the two usual social environments of home ("first place") and workplace ("second place"). Third places are essential for community building and fostering a sense of belonging.

Application to Library Spaces: Libraries, as 'third places,' provide a neutral ground where individuals from various backgrounds can gather, interact, and engage in activities outside their home and work environments. By applying the Third Place Theory, libraries can create welcoming, inclusive, and vibrant spaces that encourage social interaction, community engagement, and informal learning.

Example: Libraries are incorporating comfortable seating areas, café-style environments, and communal tables to facilitate casual interactions and foster a sense of community among users.

Concept 2: Flexible Space and Built Pedagogy

Concept: Flexible space and built pedagogy refer to the design of physical environments that support diverse teaching and learning styles. Flexibility in library design ensures that spaces can adapt to various educational activities and technological advancements.

Importance: According to the Association of College and Research Libraries (ACRL), flexible and adaptable library spaces are crucial in meeting the evolving educational needs of students and faculty. Such spaces can support a wide range of activities, from individual study to collaborative projects and interactive learning sessions.

Example: Libraries are integrating movable furniture, modular walls, and multi-purpose rooms that can be easily reconfigured to accommodate different types of learning activities and group sizes.

Concept 3: Four-Space Model

Concept: The Four-Space Model, developed by Jochumsen, Rasmussen, and Skot-Hansen, categorizes library spaces into four types: inspiration, learning, meeting, and performative spaces. This model provides a comprehensive framework for designing library environments that support various user needs and activities.

Explanation:

- **Inspiration Spaces:** Areas designed to spark creativity and imagination, often featuring art installations, exhibitions, and cozy reading nooks.
- **Learning Spaces:** Zones dedicated to educational activities, including study rooms, computer labs, and resource centers.
- **Meeting Spaces:** Spaces that facilitate social interaction and collaboration, such as group study areas, conference rooms, and casual meeting spots.
- **Performative Spaces:** Areas that support presentations, performances, and public speaking events, such as auditoriums, lecture halls, and open stages.

Example: A library might have an art gallery (inspiration space), quiet study rooms (learning spaces), group study areas with movable furniture (meeting spaces), and a multi-purpose auditorium for lectures and performances (performative space).

Table 1: Key Concepts in Library Space Innovation

Key Concept	Description	Application/Example
Third Place Theory	Libraries as community hubs for social interaction and informal learning.	Comfortable seating areas, café environments, communal tables.
Flexible Space and Built Pedagogy	Designing adaptable environments that support diverse teaching and learning styles.	Movable furniture, modular walls, multi-purpose rooms.
Four-Space Model	Categorizing library spaces into inspiration, learning, meeting, and performative spaces.	Art gallery (inspiration), quiet study rooms (learning), group study areas (meeting), multi-purpose auditorium (performative).

V. DESIGN PRINCIPLES FOR MODERN LIBRARIES

These design principles ensure that modern libraries are dynamic, inviting, and functional spaces that support the diverse needs of their users while promoting well-being and inclusivity.

Multifunctional and Adaptable Design

Principle: Multifunctional and adaptable design emphasizes the need for library spaces that can be easily reconfigured to accommodate a variety of activities and group sizes.

Importance: According to the Association of College and Research Libraries (ACRL), such designs are crucial for meeting the evolving needs of students and faculty. Flexible spaces ensure that libraries remain relevant and functional as educational practices and user demands change over time.

Design Elements:

- Movable Furniture: Tables, chairs, and partitions that can be easily rearranged to create different layouts.
- Modular Walls: Dividers that can be adjusted to create larger or smaller rooms as needed.
- Multi-purpose Rooms: Spaces that can serve various functions, such as study areas, meeting rooms, and event spaces.

Example: A library might feature rooms with sliding walls that can be opened to create larger event spaces or closed to form smaller, private study areas. Furniture on wheels allows for quick reconfiguration based on the activity.

Incorporating Natural Elements

Principle: Incorporating natural elements into library design involves integrating features like natural light, plants, and outdoor views to enhance the learning environment and well-being.

Benefits:

Enhanced Learning Environment: Natural light and views of nature can improve concentration, reduce stress, and create a more pleasant study atmosphere.

Well-being: Access to natural elements has been shown to boost mood and overall well-being, making the library a more inviting place for students and staff.

Design Elements:

- Large Windows and Skylights: Maximizing natural light exposure throughout the library.
- Indoor Plants: Incorporating greenery into the interior design to bring elements of nature indoors.
- Outdoor Views and Access: Designing spaces that offer views of gardens or green spaces and providing access to outdoor study areas.

Example: A library might include a central atrium with a glass roof to allow natural light to flood the space, indoor plants to create a calming environment, and outdoor seating areas for studying in fresh air.

User-Centred Design

Principle: User-centred design focuses on creating library spaces based on user needs and feedback, ensuring inclusivity and accessibility.

Importance: Designing with the user in mind ensures that the library meets the diverse needs of its community. Inclusive and accessible design practices make the library welcoming and usable for everyone, regardless of their abilities or backgrounds.

Design Elements:

- User Surveys and Feedback: Regularly collecting input from students and staff to understand their needs and preferences.
- Inclusive Features: Ensuring that all areas are accessible to people with disabilities, including ramps, elevators, and adjustable furniture.
- Personalization Options: Providing a variety of spaces and resources to cater to different study preferences and needs, such as quiet zones, collaborative areas, and tech-equipped rooms.

Example: A library might conduct surveys and focus groups to gather user feedback, then use this information to design spaces that include height-adjustable desks, tactile signage for visually impaired users, and gender-neutral restrooms.

Table 2: Design Principles For Modern Libraries

Design Principle	Description	Features/Examples
Multifunctional and Adaptable Design	Spaces that can be reconfigured to accommodate different activities and group sizes.	Movable furniture, modular walls, multi-purpose rooms.
Incorporating Natural Elements	Integrating natural light, plants, and outdoor views to enhance the learning environment and well-being.	Large windows, skylights, indoor plants, outdoor views and access.
User-Centred Design	Designing spaces based on user needs and feedback, ensuring inclusivity and accessibility.	User surveys, inclusive features (ramps, elevators, adjustable furniture), personalization options (quiet zones, collaborative areas).

VI. THE ROLE OF TECHNOLOGY IN LIBRARY INNOVATION

These technological advancements in digital resources and smart library systems are transforming the way libraries operate and serve their users, making them more efficient, accessible, and engaging places for academic research and learning.

Digital Resources and Services

Digital Resources:

- Online Databases: Libraries provide access to a wide array of online databases, e-journals, and e-books, enabling students and researchers to access vast amounts of information from anywhere at any time.
- Digital Repositories: These serve as centralized digital archives for storing and sharing scholarly outputs, including theses, dissertations, and research papers.
- Virtual Libraries: Platforms that offer digitized versions of library collections, allowing users to access books, manuscripts, and other materials online.

Services:

- **Virtual Reference Services:** Librarians offer assistance through chat, email, or video calls, helping users find and use digital resources effectively.
- **E-learning Support:** Libraries provide online tutorials, webinars, and digital literacy programs to support students and researchers' skills development.
- **Document Delivery Services:** Facilitating the digital delivery of articles, book chapters, and other documents directly to user's devices.

Impact on Academic Research and Learning:

- **Accessibility:** Students and researchers can access essential resources from remote locations, facilitating continuous learning and research activities.
- **Efficiency:** Quick and easy access to digital resources saves time and enhances the research process.
- **Enhanced Learning:** E-learning tools and digital resources support diverse learning styles and foster independent learning.

Smart Libraries

Internet of Things (IoT):

- **Smart Shelves:** Equipped with sensors to track the placement and movement of books, helping with inventory management and reducing misplaced items.
- **Environmental Monitoring:** Sensors monitor and adjust lighting, temperature, and humidity to create an optimal environment for both users and the preservation of materials.
- **Automated Check-in/Check-out:** RFID technology allows users to borrow and return books without human intervention, streamlining the process and reducing wait times.

Artificial Intelligence (AI):

- **Chatbots and Virtual Assistants:** AI-driven chatbots provide 24/7 assistance to users, answering queries, guiding them through the catalog, and offering personalized recommendations.
- **Predictive Analytics:** AI algorithms analyze usage patterns to predict demand for certain resources, helping libraries manage collections and plan for future acquisitions.
- **Content Personalization:** AI tools personalize user experiences by recommending books, articles, and other resources based on individual preferences and past usage.

Other Smart Technologies:

Augmented Reality (AR): Enhances the library experience by overlaying digital information on the physical environment, such as interactive maps and information about exhibits.

Automated Sorting Systems: Robots and automated systems handle book sorting and shelving, improving efficiency and reducing staff workload.

Impact on Managing Library Operations and Enhancing User Experience:

Operational Efficiency: Smart technologies streamline various library processes, reducing manual labour and improving accuracy in inventory and resource management.

User Experience: Enhancements like automated check-outs, personalized recommendations, and environmental controls create a more user-friendly and comfortable library environment.

Innovation and Engagement: AR, AI, and IoT applications provide new and engaging ways for users to interact with library resources, fostering a more dynamic and innovative learning atmosphere.

Table 3: Technology in Library Innovation

Aspect	Technology/Service	Impact
Digital Resources and Services	Online databases, digital repositories, virtual reference services, e-learning support, document delivery	Accessibility, efficiency, enhanced learning
Smart Libraries	IoT (smart shelves, environmental monitoring, automated check-in/out), AI (chatbots, predictive analytics, content personalization), AR, automated sorting systems	Operational efficiency, improved user experience, innovation and engagement

VII. IMPACT ON ACADEMIC GROWTH

Innovative library spaces have a significant impact on academic growth by fostering an environment conducive to learning, collaboration, and research. Here are some key ways these spaces contribute to academic success:

Enhanced Learning Experience

Active Learning Environments: Modern library spaces are designed to facilitate active learning, which involves engaging students through discussions, problem-solving, and hands-on activities. This approach has been shown to improve retention and understanding of material compared to traditional lecture-based learning.

Flexible Learning Spaces: By offering a variety of seating arrangements and study areas, libraries accommodate different learning styles and needs. This flexibility allows students to choose environments that best support their study habits, whether they need quiet individual study zones or collaborative group spaces.

Improved Academic Performance

Access to Resources: Innovative library spaces are equipped with advanced technology and extensive digital resources. This access helps students and researchers efficiently find and utilize information, which can lead to better quality work and higher academic performance.

Support Services: Many modern libraries offer support services such as tutoring, academic advising, and workshops on research skills. These services provide students with additional help and resources to succeed academically.

Fostering Collaboration and Innovation

Collaborative Spaces: Group study rooms and collaborative areas encourage teamwork and communication among students. Collaborative learning has been linked to higher academic achievement, as it allows students to share ideas, solve problems together, and learn from one another.

Innovation Hubs: Makerspaces and innovation labs within libraries provide students with the tools and resources to experiment, create, and innovate. These spaces support project-based learning and foster creativity, which can lead to academic breakthroughs and the development of new skills.

Supporting Research and Development

Research Facilities: Libraries with dedicated research areas and access to specialized databases support the research needs of students and faculty. This support is crucial for producing high-quality research outputs and advancing academic knowledge.

Interdisciplinary Interaction: Innovative library spaces often bring together students and faculty from different disciplines, facilitating interdisciplinary collaboration. This interaction can lead to new insights, ideas, and research opportunities that might not emerge in isolated academic environments.

Creating a Positive Academic Culture

Community Building: Libraries that serve as social and cultural hubs help build a sense of community on campus. This sense of belonging can improve student engagement and motivation, contributing to overall academic success.

Stress Reduction: Comfortable and welcoming library spaces provide students with a place to relax and unwind. Reducing stress and promoting well-being can positively impact academic performance and retention rates.

By addressing these challenges with strategic solutions, universities can successfully modernize their library spaces to better support academic growth and innovation.

VIII. SUCCESSFUL IMPLEMENTATIONS IN UNIVERSITIES – INTERNATIONAL AND NATIONAL

James B. Hunt Jr. Library- North Carolina State University

The James B. Hunt Jr. Library at NC State University is indeed a prime example of innovative library design, showcasing how modern libraries can transform from mere repositories of books to dynamic learning environments. The range of spaces and technologies it offers supports various academic and creative activities, fostering a vibrant community of learners and innovators. Here's a breakdown of some of the features you mentioned:

- **Large Auditorium and iPearl Immersion Theatre:** These spaces support large-scale events, presentations, and immersive experiences, providing a platform for knowledge dissemination and interactive learning.
- **Learning Commons:** Equipped with multi-monitor collaborative workstations, quick-check computers, and various laptop collaboration areas, these spaces promote group work and interactive computing, making collaborative learning more efficient and enjoyable.
- **Game Lab:** This area not only supports the scholarly study of digital games but also provides a recreational space for students, balancing academic rigor with relaxation.
- **Creativity Studio and Teaching & Visualization Lab:** High-technology spaces that can be configured for diverse teaching, learning, and collaborative activities across multiple disciplines, encouraging interdisciplinary collaboration and creativity.
- **4K Video Studio and Music Room:** These facilities allow for the creation and editing of digital media, supporting projects in video production, music creation, and other multimedia endeavours.
- **Fishbowl Seminar Room:** Designed to promote the open exchange of ideas, this space acts as a hub for cross-disciplinary collaboration.
- **VR Usability Lab:** Dedicated to research and academic purposes related to virtual reality, this lab provides a cutting-edge environment for exploring VR applications.
- **Skyline Terrace Reading Area and Quiet Reading Rooms:** These spaces offer serene environments for individual study and reflection, combining the traditional library experience with modern amenities.
- **Maker-Space:** A hands-on area for learning about emerging technologies and bringing creative ideas to life, encouraging innovation and practical application of knowledge.
- **Rain Garden Reading Lounge and Idea Alcove:** Informal spaces designed for relaxation and spontaneous collaboration, enhancing the library's role as a community hub.

BITS Pilani Library, Rajasthan

The BITS Pilani Library is a model of how traditional library spaces can be transformed to incorporate modern amenities and technologies. Some of its notable features include:

- **Self-Issue/Return Space:** Streamlining the borrowing process with self-service options.
- **E-zone:** Dedicated area for electronic resources and digital media.
- **New Arrival Section & Faculty Publication Display:** Showcasing recent additions and faculty work to keep the community updated and engaged.
- **BITS Heritage Gallery & Library Events Photo Display:** Celebrating the institution's history and documenting library events.
- **Charging Stations:** Ensuring users can keep their devices powered throughout the day.
- **GD Birla Rare Books Section:** Preserving and providing access to rare books that are 100–300 years old.
- **Brainstorm & Group Discussion Room:** Facilitating collaborative learning and idea exchange.
- **Research Zone & Innovation Zone & Maker-space:** Supporting research activities and hands-on innovation with tools and space for experimentation.
- **Study Carrels:** Offering private study spaces.

- Children's Section & Art Collection Space: Creating a welcoming environment for children and showcasing art.
- Refreshment Zone: Providing a space for users to relax and refresh with tea/coffee.

Vikram Sarabhai Library at IIM Ahmedabad

The Vikram Sarabhai Library exemplifies how renovations can breathe new life into an institution, enhancing both functionality and user experience. Key features include:

- Interactive and Well-Equipped Discussion Rooms: Promoting collaborative learning and discussions.
- Tinker Space with 3D Printer and Open-Source Electronics: Encouraging hands-on learning and innovation.
- Virtual Reality Space & VR App: Providing immersive experiences and virtual tours of the library.
- Well-Lit Individual Carrels: Ensuring comfortable and private study spaces.
- Laptop Collaboration Areas: Supporting group work and digital collaboration.
- Scanning, Printing, and Photocopying Area: Offering essential services for academic work.
- Technology for Visually Impaired People: Inclusive design with tools like Kibo XS, JAWS talking software, and SARA CE.
- Interactive Video Wall: Enhancing visual engagement and information dissemination.
- Children's Area: Creating a family-friendly space within the library.
- Kindle Readers for eBooks: Providing access to a wide range of digital books.

These examples demonstrate a significant shift in how libraries are perceived and utilized, moving towards becoming central hubs for learning, innovation, and community engagement.

IX. CHALLENGES AND SOLUTIONS

Challenge 1: Budget Constraints

Solution: Universities have sought funding from government grants, alumni donations, and partnerships with private companies to finance the modernization of library spaces.

Challenge 2: Technological Integration

Solution: Institutions have phased the implementation of technology upgrades, starting with the most critical areas and gradually expanding. They also provide regular training for staff and students to effectively use new technologies.

Challenge 3: Space Utilization

Solution: Libraries have conducted surveys and needs assessments to understand how students use library spaces. This data has informed the redesign, ensuring that spaces are multifunctional and cater to various academic activities.

Challenge 4: Resistance to Change

Solution: Universities have engaged stakeholders, including students, faculty, and staff, in the planning process to ensure buy-in and address concerns. Pilot projects and incremental changes have also helped ease the transition.

By adopting similar strategies, other libraries in India can also enhance their services and better meet the evolving needs of their users.

X. CONCLUSION

As the educational landscape continues to evolve, universities must recognize the pivotal role that library spaces play in supporting academic growth and innovation. Investing in modern, flexible, and technologically advanced library environments is crucial for creating spaces that not only meet the current needs of students and faculty but also anticipate future demands.

By adopting the successful strategies and solutions highlighted in these case studies, universities can develop libraries that serve as vibrant academic hubs. These spaces will not only enhance research output and learning experiences but also position institutions as leaders in the ever-changing world of higher education.

Universities are encouraged to take bold steps towards reimagining their library spaces, leveraging innovative design and technology to stay relevant and foster a culture of academic excellence.

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