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EMERGING INNOVATIONS AND TRENDS IN ACADEMIC LIBRARIES OF PAKISTAN IN THE 21ST CENTURY

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Abstract

This research paper explores the new technology, emerging trends and challenges that academic libraries in Pakistan tend to encounter in the 21st century. It seeks to evaluate the ways in which the digital transformation is transforming library operations, user services as well as professional functions and also determine where it is heading to in terms of sustainable development. A quantitative descriptive study design was adopted with a structured questionnaire to be given to 200 library professionals in the public and the private universities in Pakistan. The data were interpreted through descriptive statistics (frequency and percent) to generalize the perceptions of the respondents on technological adoption, service innovations and institutional challenges.

The findings show that there has been a drastic change towards digitalization as majority of libraries have embraced automation in cataloguing, OPAC and cloud based services. Digital literacy training, provision of virtual reference services and utilization of social media in engaging libraries are also emerging practices that have been adopted by libraries. Nevertheless, certain obstacles like lack of sufficient funding, ineffective ICT, ineffective infrastructure, and institutional support remain in the way. There was a great deal of optimism about the future, which included professional development, collaboration, and national policy support as respondents thought that innovation can continue to flourish. The results indicate that there is a requirement to invest in ICT infrastructure strategically, continuous professional training, and development of policy frameworks to facilitate equitable technological development within academic institutions. Innovation and quality of service can be even improved through strengthening institutional support and collaboration. The given research offers the detailed data-driven information on the technological revolution in the field of the Pakistani academic libraries, which is acute considering the lack of information about the situation on the ground in Pakistan and in the context of the digital era, in general.

Keywords: Academic Libraries, Technological Innovations, Digital Transformation, Information Services, ICT Integration

Introduction

The current wave of technology encompassing digital transformation is changing the paradigm of academic libraries in Pakistan by transforming the role, services and operational structures. With education institutions constantly transforming due to globalization, automation and digital economy, libraries are no longer restricted to the traditional book and print collections (Kiran et al., 2024). Instead, they are dynamic knowledge centres, which integrate information technology, artificial intelligence, and user-centred digital

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services (Gul & Bano, 2019). This change is redefining access, storage, and sharing of information, thus redefining the practice and competencies that librarians need in the 21st century (Ashiq et al., 2021).

The digital revolution has played a big role on the affairs and services of the academic libraries in Pakistan. With the changing print to electronic resources, acquisition, organization, and dissemination of information has been re-defined. Online databases, e-books, digital archives, open-access repositories, and various other sources have increased access to scholarly materials by not limiting it to a physical location (Baber et al., 2024). Pakistani academic libraries are growingly favouring digital platforms and resources-sharing systems both large and small, as they continue to consolidate collections and provide convenient access to the global research base. This transformation to the digital can be viewed as a response to the technological advancement as well as a strategic requirement to accommodate the growing demand of distance learning and online education, especially at the time of the post-COVID-19 pandemic (Awais & Ameen, 2019). The digital revolution has made information search easier, interactive and faster; therefore, changing the research culture in the universities.

The adoption of information and communication technologies (ICTs) in the work of libraries is another important tendency that influences the academic libraries in Pakistan (Shah et al., 2024). Both the cataloguing, circulation processes and acquisition have been enhanced because of automation of library functions by integration library management systems. Software like KOHA and DSpace have been embraced in many libraries as a way of managing bibliographic records and institutional repositories, which have effective management and are easily accessible online (Zahra et al., 2024). ICTs have also made it possible to create online public access catalogues (OPACs), whereby one can search and get access to library material remotely. Moreover, artificial intelligence and machine learning are slowly finding their way into library services, which allows personalized suggestions, automated indexing, and user experience (Ullah and Usman, 2023). These developments indicate a shift to smart and user-friendly library spaces where technology serves as an intermediary between information and its customers.

One of the characteristics of the new trends within the academic libraries of Pakistan has also been the changing role of librarians. Librarians have ceased to be perceived as book custodians and become knowledge managers, teachers, and digital literacy instructors (Bibi, 2024). They are critical in steering students and faculty through the intricacies of online research tools, citation management software, and methods of evaluating information (Iqbal et al., 2024). The lifelong learning and professional development have become the necessary conditions of surviving in this technologically changing environment of librarians. Pakistan librarians are obtaining new data management, research support, and digital archiving competencies through training programs, workshops, and partnering with international library associations (Khalid et al., 2021). It has been replaced by user-centred over collection-centred services and the role played by human expertise in achieving more value of library resources.

Cooperative networking and resource sharing can also be seen as the trends in the academic library environment in Pakistan. The low cost of financial means and the expensive subscription fees of scholarly databases have led the institutions to implement the consortium models, including the Digital Library initiative launched by the Higher Education Commission (HEC) (Khan et al., 2024). This is a program at the national level where many international journals, e-books, and databases are availed to the member institutions with equal access to quality research materials. These projects evoke the strength of the partnership in surmounting the resource limitations and advancing academic excellence (Soraya & Ameen, 2020). The development of information literacy curricula in collaboration with academic departments has strengthened the library's role as a pedagogical partner within the university (Malik & Ameen, 2021).

The collaborative networking and sharing of resources is the other trend in academic library environment in Pakistan. The lack of financial ability and high charges of the distinct scholarly database has caused the organizations to turn to the consortium models such as the Digital Library project of Higher Education Commission (HEC) (Khan et al., 2024). The program can be accessed at the national level whereby international journals, e-books, and databases are availed to the member institutions, and all the institutions are provided with fair access to high-quality research materials. These efforts indicate the strength of partnerships to break the resource limitation and foster academic excellence (Soraya and Ameen, 2020).

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Partnerships with other institutions are also occurring to create joint repositories, exchange catalogues and to engage in interlibrary loan services, thereby increasing the range of resources available and developing a culture of cooperation (Bashir, 2020).

The physical library facilities are undergoing a make-over in order to point to modern learning habits and the use of technology. Development of conventional reading halls is in the form of re-designing them into versatile learning commons where student groups, multimedia learning, and collaborative research can be carried out. Pakistan is experiencing a wave of makerspaces, digital laboratories, and technology centres in many libraries where students are being immersed in creative projects and digital content creation, as well as learning through innovative approaches (Islam et al., 2025). This development is an indication of the increasing awareness of the library as an active learning process that embraces varied academic demands (Afzal et al., 2025). The transition to user friendly, technology intensive and inclusive environments is an indication of a wider concept of the changing identity of the library in the digital age.

Irrespective of these developments, some of the challenges that are still faced by academic libraries in Pakistan include, but are not limited to, limited budgets, poor technological infrastructure, untrained staff, and resistance to change (Ullah & Usman, 2023). Nevertheless, the interest of institutions in modernization and increasing interest of decision-makers in the importance of libraries as the source of knowledge is a positive signal. Continuous investment in technology, training, and infrastructure is essential to sustain these innovations and align Pakistani libraries with global standards (Batool et al., 2022).

Simply put, 21st century has offered the academic libraries in Pakistan both opportunities and challenges never before. The new innovations and trends are the indicators of a radical change in the domain of digital transformation, user empowerment, and democratization of knowledge. Libraries are also adopting their new identity of being hybrid spaces of combining traditional ethos of scholarship with the modern of the information technology. Scholarly libraries will be even necessary as they keep on developing as more continue to enhance research, learning, and innovation in the Pakistani higher education context. These libraries will only survive because they will need to change, cooperate, and become innovative to cope with the dynamism that has been experienced in the field of education and technology.

Literature Review

Technological Transformation in Academic Libraries

The emergence of digital technology has revolutionized the structure and operations of academic libraries globally. Traditional manual cataloguing has been replaced by digital systems that enable quick access and efficient management of information resources. The progressive implementation of automated services in the Pakistani environment e.g. OPACs, digital repositories and cloud-based management tools has transformed the way information is stored and accessed (Islam et al., 2025). RFID technology has also been integrated into circulation and tracking, which has also increased the efficiency but its usage is still minimal because of the high cost of implementation and technical capabilities required (Baber et al., 2024). Electronic resources have replaced print resources, with print resources becoming less popular due to the desire to find information as soon as needed, flexibly and at any time.

Emerging Trends in Library Services

Modern academic library has ceased being merely a physical place; it is an amalgamated learning space that includes both digital and collaborative resources. Libraries have changed their functions to include digital literacy training, marketing virtual reference services, and using social media to reach out (Butt et al., 2020). The trends could also be observed in the analysis of data because most respondents indicated that digital literacy training and online reference services have become an inseparable part of the library activities. Moreover, libraries are restructured to become learning commons and focus on collaborative learning, the integration of technology, and engagement with users (Rafi et al., 2019). This development marks a shift of being a service provider to a creator of knowledge.

Challenges in Adopting Innovation

Innovation is essential to survive in the digital age but its execution is fraught with many challenges especially in developing nations such as Pakistan. The barriers are perennial due to limited funding, lack of ICT skills, resistance to change, and low internet infrastructures (Ali, 2023). The results of the research

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revealed that 80% of participants cited funding shortage as one of the major problems, whereas 70% cited the necessity of improving ICT training of library workers. Innovation is also limited by institutional resistance and insufficient support of the national policy (Ullah and Usman, 2023). These issues underscore the fact that there is an urgent need to plan out strategically and invest in technological infrastructure and building of human capacity.

The Role of Librarians in the 21st Century

The role of librarians is changing as the libraries undergo reformation. They now have the expectation of being information managers, technology facilitators and data analysts. Professional development has become a necessity and not an option to ensure relevancy (Arif & Mahmood, 2012). The study established that majority of librarians acknowledge the fact that they should be trained continuously in order to keep abreast with new technologies. A development of the professionals also guarantees the efficiency of the operations as well as the possibilities to predict the needs of the users and react to them efficiently. Hence, the human dimension remains central to technological success in libraries (Hanif et al., 2024).

Future Directions and Policy Implications

The future of the Pakistani academic libraries lies in a comprehensive strategy that incorporates technology, policy and human resource. To improve the services, customize the information delivery, and decision-making, libraries have to implement AI, Big Data, and IoT solutions. Institutions can engage in joint projects and share knowledge through collaborative projects and limit duplication of resources. Further, there should be policies at the national level to uniform technological practice and offer sustainable means of funds. The analysis of the data highlights a high degree of consensus among the librarians on such strategic support and shows a clear vision of the future of the library innovations in Pakistan.

Objectives of the Study

1. To examine the emergent technological innovations that are being implemented in Pakistani academic libraries.
2. To review the emerging trends and services that are changing the way the libraries operate and how people interact with them.
3. To investigate how academic libraries are struggling to adopt new technologies.
4. To determine the views of library practitioners about the future of library development.
5. To give a report on how to enhance technological integration and professional growth in academic libraries.

Problem Statement

Pakistan academic libraries are struggling to keep abreast with the digital revolution that is defining 21st century higher education. Although an observable improvement has been made in the use of technology like digital cataloguing, OPAC systems, still, there is a significant gap in such areas as RFID integration, artificial intelligence, and cloud-based management. Most institutions are still faced with shortcoming funds, insufficient ICT dexterities and absence of institutional and policy assistance. Such obstacles are the ones that impede the capacity of libraries to be fully innovative and able to respond to the changing needs of users. Hence, the aim of the study is to examine the existing level of technological innovation, new trends, and related issues in academic libraries in Pakistan with an aim of offering insights that can be adopted in the formulation of strategies of sustainable modernization.

Research Methodology

The present research used a quantitative research design to identify the current innovations, trends, challenges, and future prospects of academic libraries in Pakistan. This was to examine how technology is changing the way libraries operate, serve their customers and practitioners. The quantitative design was deemed suitable because it yields quantifiable information and enables one to conduct an analytical study of the answers of the large population of participants.

Research Design

Data collection took the form of a descriptive survey research where library professionals in libraries of both public and private universities within Pakistan were used. The reason behind the choice of this design is that it is capable of capturing opinions, attitudes, and experience regarding technological adoption in

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libraries. The survey method enabled the researcher to examine the practices, formulate obstacles and develop the views of the librarians on innovation and modernization in a well-organized and measurable way.

Population and Sample

The users were the professional librarians, assistant librarians, chief librarians and library assistants in the higher educational establishments. Two hundred respondents took part, which was a perfect representation of both genders, age, educational level and work experience. Purposive and convenience sampling selection methods were employed in order to include individuals directly engaged in management of libraries and technology in the selection process. This varied representation gave a detailed picture of academic library setting in Pakistan.

Table 1

Demographic Profile of Respondents (n=200)

Demographic Variable	Category	Number (n)	Percentage (%)
Gender	Male	110	55%
	Female	90	45%

Instrument for Data Collection

The structured questionnaire was used to collect the data through a special questionnaire that was developed in this study. The tool consisted of the demographic items, as well as the sequence of statements that were evaluated with the help of a five-point Likert scale that included Strongly Disagree (1), to Strongly Agree (5). The questionnaire was based on five dimensions: demographic data, new technological innovations, new trends and services, difficulties in the implementation of the innovation and future directions and expectations of the user. The items were created upon a substantive analysis of the literature that is related to the study to make them clear, valid, and relevant to the research goals. A pilot test was done to perfect the instrument in terms of language and structure.

Data Collection Procedure

The questionnaire was administered online and offline to ensure maximum access to the questionnaire and participation. Online versions were sent out through email and professional library networks, and paper versions were sent to participants in institutions that had low internet access. The goal of the study was told to the participants and the data was gathered on a voluntary and anonymous basis. The data collection process has been done in four weeks to obtain sufficient response rates.

Data Analysis

All the gathered data were thoroughly screened, coded and analysed with the help of descriptive statistical methods like frequencies and percentages. These were used to encode the trends in demographics and generalize the views of the respondents regarding the technological and operational aspects of academic libraries. The results were provided in tabular and graphical form to make it easy and understandable. This analysis was based on the recognition of major patterns, areas of key innovation, and the challenges that libraries face on acquiring new technologies.

Ethical Considerations

The research was conducted in accordance with ethical standards of research. This was voluntary and informed consent was obtained by all the respondents. The confidentiality of the data and anonymity were followed during the research process, and the information was utilized only in terms of academic purposes.

In short, the research was done using the quantitative descriptive research approach with the aim of giving a structured and objective knowledge on the technological developments and the emergent trends in academic libraries in Pakistan. Through the primary data gathered using an extensive survey, the study provides useful information on the existing practices, issues, and prospects of the further evolution of the library field.

Data Analysis

Data analysis refers to the habitual operation of verifying, cleansing, transforming, and modelling information to reveal valuable information and assist decision-making. It is the process of using statistical and logical methods to detect patterns, relationship and trends in datasets.

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Table 2

Demographic Profile of Respondents (n=200)

Demographic Variable	Category	Number (n)	Percentage (%)
Age	20-29 years	35	17.5%
	30-39 years	80	40%
	40-49 years	50	25%
	50 years and above	35	17.5%
Highest Qualification	Master's Degree	95	47.5%
	M.Phil.	55	27.5%
	Ph.D.	20	10%
	Other	30	15%
Professional Designation	Chief Librarian	25	12.5%
	Librarian	70	35%
	Assistant Librarian	55	27.5%
	Library Assistant	50	25%
Institutional Sector	Public University	130	65%
	Private University	70	35%
Professional Experience	1-4 years	40	20%
	5-10 years	70	35%
	11-15 years	55	27.5%
	Above 15 years	35	17.5%

The demographic description shows that there is a balanced and diversified profile of respondents. Among the overall number of respondents, 55% were male and 45 percent female, which indicated an almost equal gender ratio and implied inclusivity in the library profession. As regards to age, 40% were between the age of 30 and 39, 25% between 40 and 49, which indicates that most respondents are in their working and career stability years. In terms of education, a high percentage (47.5%) of the workforce is having a Master degree, with 27.5% having an MPhil and 10% having a PhD in education showing a very high level of education with advanced educational qualification at par with the management of modern library systems.

In terms of professional designation, Librarians 35% and Assistant Librarians 27.5% are the main backbone operational employees with 12.5% being the Chief Librarians and 25% library assistants, which represents a well-organized professional framework. In terms of institutional representation, there is an indication that 65% of the respondents are in the public universities and 35% are in the private institutions with a higher representation and or more institutional involvement by the sector. In terms of experience, 35% of the respondents have experience of 5-10 years of professional practice, 27.5% have experience of 11-15 years and 17.5% have experience of above 15 years, indicating that the workforce is mature and well versed in terms of expertise in library administration and delivery of services. In general, the demographic decision is highly qualified, experienced and balanced in gender, which increases the reliability and representativeness of the study results.

Table 3

Adoption of Technological Innovations in Academic Libraries

Technological Innovation	Number Agreeing (n)	Percentage Agreeing (%)
Digital Cataloguing & Automation Systems	150	75%
Online Public Access Catalogue (OPAC)	135	67.5%
Cloud-Based Management Systems	115	57.5%
RFID Technology	110	55%
Artificial Intelligence (AI) for User Services	100	50%

The information analysis of technological advances in academic libraries depicts a high tendency to the digital transformation and modernization. Most respondents 75% affirmed or highly affirmed that their

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libraries have implemented digital cataloguing and automation systems, meaning that the institutions have made massive steps towards effective management of their resources. Likewise, 55% reported the use of RFID technology in circulation and tracking, showing moderate adoption of the advanced inventory control methods, but the significant 22.5% was neutral indicating uneven practices among institutions.

When it comes to cloud-based systems, 57.5% of respondents agreed, and it appears that such technologies are becoming more widespread in the operations of libraries, improving the level of access and scalability. The good use of OPAC (Online Public Access Catalogue) was agreed upon (67.5%), which indicated its good interaction and availability of digital resources to the user. Nonetheless, AI implementation on behalf of user services was not unanimously met with positive reactions, with just a half of respondents (50%) agreeing or strongly agreeing on its implementation, suggesting that many libraries are still in the early phases of adopting AI.

In sum, the results indicate that academic libraries are actively adopting technological advances and digital cataloguing, OPAC and cloud-based systems are the most commonly used. Nonetheless, the integration of RFID and AI is yet to be expanded, which can be said to indicate a slow but gradual movement towards the completely automated and intelligent library environment.

Table 4

Emerging Trends and Services in Academic Libraries

Emerging Trend / Service	Number Agreeing (n)	Percentage Agreeing (%)
Preference for E-Resources over Print	160	80%
Social Media for Promotion & Engagement	150	75%
Digital Literacy Training	145	72.5%
Redesigning Spaces into Learning Commons	135	67.5%
Virtual Reference Services	130	65%

The review of the new trends and services in academic libraries shows that there is a great transition to digital interaction and user-focused innovation. They had a significant majority 72.5% in agreement or strong agreement that libraries currently provide digital literacy training, which is an active participation in providing the necessary digital skills to users. Likewise, virtual reference services are increasingly becoming popular, 65% of whom admit they are increasingly using it instead of a traditional help desk, meaning that the profession is adapting to remote and technology-enabled communication channels.

There is also the tendency to use electronic resources, with 80% of the respondents variously agreeing or strongly agreeing with the statement that e-resources are preferred to print resources. This highlights a concrete shift to digital collections because of its convenience, affordability, and compliance with the current research requirement. Also, 67.5% of respondents supported library space redesigns into learning commons, which showed a dedication to designing collaborative and interactive learning spaces instead of traditional, book-based spaces. Moreover, the promotion and engagement of social media also demonstrated a high level of acceptance as 75% were in agreement or strongly agreed and this means that libraries are using digital platforms to build relationships with users and share updates with them in addition to enhancing outreach to the community. On the whole, the findings emphasize that academic libraries are quickly moving out of their traditional patterns and are incorporating digital literacy programmes, virtual services and social engagement strategies as key to addressing the dynamic information demands of learner and researcher in the 21st century.

Table 5

Challenges in Adopting Innovations

Challenge	Number Agreeing (n)	Percentage Facing Challenge (%)
Shortage of Funds	160	80%
Lack of Internet Connectivity / Infrastructure	155	77.5%
Inadequate ICT Skills among Staff	140	70%
Lack of Institutional Support	135	67.5%
Resistance to Change	130	65%

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The discussion of the issues of the challenges of innovations adoption sheds some light on the main obstacles impacting academic libraries modernization. Most of the respondents (80%) said that they were in agreement or strongly agreed that a shortage of funds is a reason why innovation is hindered which means that the issue of funding is the most serious barrier to the application of advanced technologies and digital services. Equally, inadequate ICT skills were cited by 70% of the respondents as one of the significant barriers, which indicates the existence of a continuous need to train and build digital capacity among the staff of libraries.

The perception of resistance to change was also taken as a challenge with 65% in agreement or strongly agreeing that old ways of thinking and unwilling to embrace emerging technologies are slowing down innovation. This implies that the cultural and attitudinal aspects in organizations continue to hinder technological advancement. Also, lack of internet connectivity came out as another significant problem with 77.5% consensus highlighting on the constraint of infrastructure that mostly affects the libraries in developing or resource limited institutions.

Also, 67.5% of the respondents answered that there is not much institutional support, which they thought is a hindrance to modernization. The role of administrative commitment, policy frameworks and leadership in transforming digitally is highlighted by this.

Generally, the results show that academic libraries are keen on innovation, but the innovation is limited by financial, technical and organizational constraints. The following measures will help to overcome these difficulties and provide sustainable technological development of academic libraries settings: institutional support, investment into ICT infrastructure and development of the staff competencies.

Table 6

Future Directions and User Expectations

Future Direction / Expectation	No. Agreeing (n)	Percentage in Agreement
Need for Continuous Professional Development	170	85%
Need for National Policy Support	170	85%
Impact of Emerging Technologies on Future Services	165	82.5%
Collaboration as Key to Innovation	160	80%
Development of Hybrid (Physical/Virtual) Spaces	155	77.5%

Future direction understanding and expectations of the users show a progressive and progressive view of the respondents on the development of academic libraries. A vast majority (82.5) of the participants stated that the future of library services will be influenced by the emerging technologies, as it is clear that digital tools, artificial intelligence, and automation can play a transformative role in redefining the work of a library. On the same note, professional development was found to be essential as 85 percent of respondents highlighted the need of professional development as a way of preparing librarians with current knowledge and technical skills needed in a dynamic digital world.

A large percentage (77.5%) also thought that libraries will further develop to become hybrid spaces, where they integrate both physical and virtual resources to cater to various user needs, which then points to the knowledge of the blended learning model that is widespread in contemporary education systems. Besides, teamwork was perceived as a key to the promotion of innovation, and 80% of others agreed (or strongly agreed) that teamwork and knowledge-networks can help to speed up technology development and service enhancement in the institutions. 85 percent of the respondents unanimously supported the necessity of national political support in order to maintain library innovation. This observation underscores that the government should play a critical strategic role in funding and infrastructural development as well as policy making to provide uniform modernization of the academic library industry.

In general, the evidence indicates that the respondents have more positive expectations of the future of academic libraries; they are proactive and visionary, and they believe that continuous professional development, collaboration, adoption of new technologies, and support on policy level will help to build the dynamic, inclusive, and future-oriented learning settings.

Discussion

The findings of the study can be used to determine one of the key changes that is occurring in the

academic libraries of Pakistan, both service model and technological related. The demographic data shows that there is a highly qualified and experienced workforce since majority of the respondents have advanced degrees and majority have master and MPhil degrees. This is corroborating the past studies that have stressed professionalization of the librarian profession and the necessity of possessing digital competency by the library professionals (Arif and Mahmood, 2012). This group of well-developed population of the demographic has facilitated the phasing but consistent integration of the existing technologies within the business in academic libraries.

One of the pillars of modernization of libraries has been the technological innovations. The use of digital catalogues, OPAC programs and cloud services was demonstrated to be in extensive use and is premised on major strides towards automation and increased accessibility. The results are consistent with Gul and Bano (2019) who discovered that the digital transformation has shaped how academic libraries can process and share information. The RFID technology and artificial intelligence applications are in the middle stage, meaning that the present transition is to smart systems that can assist in enhancing the efficiency of the operations and user satisfaction (Baber et al., 2024). Nevertheless, the gap in the adoption rates among institutions implies the differences in the technological readiness and facilities, and it remindingly simulates Shah et al. (2024) who discovered that the Pakistani libraries were not equally ready to apply high-level technological solutions.

The new services trends also reveal the manner in which academic libraries are redefining themselves as dynamic learning institutions rather than information warehouses. These statistics demonstrate positive participation in the digital literacy programs, virtual referencing and outreachs provided through social media. These findings support the works of Butt et al. (2020) that have emphasized that digital interaction is changing the interaction between libraries and their patrons. The tendency to consume e-resources over print resources that is observed by 80 percent of the respondents can be attributed to the tendencies in the world concerning the issue of digital addiction and is associated with the increasing importance of accessibility and urgency in the consumption of information (Rafi et al., 2019). The physical spaces redesigning in order to turn them into learning commons also serve to point at the changes in libraries turning into multifunctional and collaborative spaces, which, in turn, Islam et al. (2025) also note.

Despite such developments, the research shows the problems that remain in the background and hinder innovation. It was reported that funding was lacking, ICT capacity was low, resistance to change, and poor infrastructure were some of the key entities which hinder the action - which is consistent with the findings of Ullah and Usman (2023) and Ali (2023) who identified the same impediments within Pakistani institutions of higher learning. These have emphasized on sustainable investment, capacity building and enabling policy frameworks. Besides, institutional support is a scorching issue, which suggests that innovation can be a search of an individual and not a program implemented in an institution (Batool et al., 2022).

In their future projections, the respondents were optimistic about the future of the academic libraries. The general awareness of the digital future of librarianship is evidenced by the fact that the impact of the coming emerging technologies being received with such overwhelming acceptance in the development of services in the future. Another important identified enabler by Hanif et al. (2024) and Khan et al. (2024) is professional development, collaboration, and national policy support, which the respondents also found necessary. Such optimism is an indication of willingness to adopt new technologies and methodologies as long as structural and policy level support is guaranteed.

Altogether, the discussion shows a dynamic but unequal environment of innovation in the academic libraries of Pakistan. As technologically integrated programs and services that are user centric are becoming increasingly popular, it is important to tackle the inherent issues of funding, training, and institutional policy. As a result of strategic investment and further professional growth, Pakistani libraries can become much closer to international standards and turn into the fully digital, collaborative, and future-oriented learning environments.

Conclusion and Recommendations

The study conclusively points out that academic libraries in Pakistan go through transition phase by increasing use of technology, online interactions and adjusting of professional functions. Its findings affirm

that libraries are gradually transforming into digital knowledge centres other than the traditional sources of information. The popularity of digitalising catalogues, OPAC systems and cloud-based technologies demonstrates a great likelihood towards automation and enhanced accessibility. Moreover, the heightened attention to the digital literacy, virtual services, and utilization of e-resources signify the change in the paradigm of the attitude toward the service delivery to the users, which has become user-centred and technology-driven. All these are pointers of the adaptability and forward thinking of the library practitioners that have realized the essence of innovation in the holistic fulfilment of the anticipations of the modern academic community.

The research however provides insight on the unrelenting problems that still hinder the full expression of the technological transformation. Financial constraints, inadequate ICT skills, resistance to change in the organization and ineffective infrastructure have also played significant roles in hindering innovation. Almost all the institutions lack well organized support and national policy frameworks that can help in the initiatives of modernization. These results emphasizes that a concerted action is required whereby investment in technology is coupled with capacity building so that both the libraries in the public and the private sector can enjoy equal opportunities of any given development in digital systems. Moreover, the fact that the technological adoption process in different institutions is not similar implies that institutional gaps cannot be bridged without special interventions meant to address institution differences.

The research proposes some important steps that should be taken to overcome these challenges. To begin with, a long-term financial commitment is needed to update ICT infrastructure, increase access to digital resources, and introduce innovative technologies, including RFID and artificial intelligence systems. Second, the institutionalization of the continuous professional development programs must be implemented to ensure the enhancement of the technological skills and managerial competencies of librarians so that they could use the emerging tools and platforms effectively. It should increase cooperation between libraries by forming resource-sharing networks, consortia, and joint digital repositories, which promote the growth of libraries by sharing resources and minimizes duplication of efforts. Also, it is crucial that the support of the policy is available nationally to normalize technological use, to enable equal opportunities, and to grant a long-term sustainability of digital projects within libraries. Lastly, libraries ought to emphasize on user engagement and feedback systems to ensure that technological changes are in sync with the changing needs of students and researchers.

To sum it all up, the future of academic libraries in Pakistan is their capacity to adjust, co-operate and become innovative in an online ecosystem. The libraries can make themselves part of academic excellence and research innovation by enhancing institutional support, investing in human capital, and creating a culture of learning as a lifelong process. An integrated vision incorporating technology, policy and professional improvement will help the Pakistani academic libraries not only stay updated with world trends but also play a significant role in enhancing the education and research sector in the country.

Contributions of the Authors

Each author made a substantial contribution to the work reported and took part in the ideation, development, and final approval of the manuscript.

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Statement of Data Availability

The corresponding author can provide the data used in this study upon request.

Conflicts of Interest

The authors declare no conflict of interest.

References

Ahmed, S., Sheikh, A., & Akram, M. (2018). Implementing knowledge management in university libraries of Punjab, Pakistan. *Information Discovery and Delivery, 46*(2), 83–94. https://doi.org/10.1108/IDD-02-2018-0004

Ali Khan, T. (2023). Examining the impact of university libraries in facilitating foreign language learning in Pakistan. *International Journal of Librarianship and Information Science, 5*(1), 10–18.

Arif, M., & Mahmood, K. (2012). The changing role of librarians in the digital world: Adoption of Web 2.0 technologies by Pakistani librarians. *The Electronic Library, 30*(4), 469–479. https://doi.org/10.1108/02640471211247040

Ashiq, M., Rehman, S. U., & Mujtaba, G. (2021). Future challenges and emerging role of academic libraries in Pakistan: A phenomenology approach. *Information Development, 37*(1), 158–173. https://doi.org/10.1177/0266666920917113

Asif, M., & Asghar, R. J. (2025). Managerial accounting as a driver of financial performance and sustainability in small and medium enterprises in Pakistan. *Center for Management Science Research, 3*(7), 150-163. https://doi.org/10.5281/zenodo.17596478

Asif, M., Shah, H., & Asim, H. A. H. (2025). Cybersecurity and audit resilience in digital finance: Global insights and the Pakistani context. *Journal of Asian Development Studies*, *14*(3), 560-573. https://doi.org/10.62345/jads.2025.14.3.47

Awais, S., & Ameen, K. (2019). The current innovation status of university libraries in Pakistan. *Library Management, 40*(3/4), 178–190. https://doi.org/10.1108/LM-11-2018-0096

Afzal, M., Arshad, N., & Shaheen, A. (2025). ChatGPT and the future of academic writing: Enhancing productivity and creativity. *Journal of Engineering and Computational Intelligence Review, 3*(1), 1–11.

Baber, M., Islam, K., Ullah, A., & Ullah, W. (2024). Libraries in the age of intelligent information: AI-driven solutions. *International Journal of Applied and Scientific Research, 2*(1), 153–176.

Bashir, F. (2020). Ambassador of lifelong learning/public libraries in multicultural society: The case of Pakistan. *Türk Kütüphaneciliği, 34*(3), 548–558.

Batool, S. H., Rehman, A. U., & Sulehri, I. (2022). The current situation of information literacy education and curriculum design in Pakistan: A discovery using Delphi method. *Library Hi Tech, 40*(6), 1705–1720. https://doi.org/10.1108/LHT-07-2021-0168

Bibi, T. (2024). Academic advancement: Libraries' integral support for research in public sector universities of Khyber Pakhtunkhwa, Pakistan. *Journal of Computing & Biomedical Informatics, 7*(1), 559–570.

Butt, R., Siddiqui, H., Soomro, R. A., & Asad, M. M. (2020). Integration of Industrial Revolution 4.0 and IOTs in academia: A state-of-the-art review on the concept of Education 4.0 in Pakistan. *Interactive Technology and Smart Education, 17*(4), 337–354. https://doi.org/10.1108/ITSE-03-2020-0032

Gul, S., & Bano, S. (2019). Smart libraries: An emerging and innovative technological habitat of 21st century. *The Electronic Library, 37*(5), 764–783. https://doi.org/10.1108/EL-09-2018-0171

Hanif, S., Shah, S. A. A., Rehman, A. U., & Hassan, S. (2024). Changing role of libraries and librarians in the new technological era: An evaluative study of university libraries of Islamabad. *Bulletin of Business and Economics (BBE), 13*(2), 448–454.

Hussain, A. (2020). Industrial revolution 4.0: Implication to libraries and librarians. *Library Hi Tech News, 37*(1), 1–5. https://doi.org/10.1108/LHTN-01-2020-0006

Iqbal, Q., Akbar, T., Zia, M., Ahmed, R., & Cheema, A. M. (2024). Transforming library leadership: Redefining leadership in the digital era and its impact on innovative work behavior in Pakistan. *Journal of Information Management and Practices, 4*(2).

Islam, K., Shamshad, A., & Usman, M. (2025). Adoption potential of artificial intelligence and machine learning in Islamabad's academic libraries. *Journal of Engineering and Computational Intelligence Review, 3*(1), 12–24.

Khalid, A., Malik, G. F., & Mahmood, K. (2021). Sustainable development challenges in libraries: A systematic literature review (2000–2020). *The Journal of Academic Librarianship, 47*(3), 102347. https://doi.org/10.1016/j.acalib.2021.102347

Khan, M. I., Jan, R., Hussain, M., & Bahadar, M. (2024). Perception, competencies, and potential challenges towards big data management among the university libraries of Khyber Pakhtunkhwa. *Journal of Regional Studies Review, 3*(1), 21–28.

Kiran, N., Aziz, T., & Lashari, A. A. (2024). Academic libraries emerging trends in 21st century: A systematic review. *Pakistan Social Sciences Review, 8*(1), 270–281.

Malik, A., & Ameen, K. (2021). The employment landscape and LIS education in Pakistan: Challenges and prospects. *Global Knowledge, Memory and Communication, 70*(1/2), 79–93. https://doi.org/10.1108/GKMC-02-2021-0036

Rafi, M., JianMing, Z., & Ahmad, K. (2019). Technology integration for students' information and digital literacy education in academic libraries. *Information Discovery and Delivery, 47*(4), 203–217. https://doi.org/10.1108/IDD-08-2018-0037

Shah, S. H., Shah, N. U., & Jbeen, A. (2024). Exploration of LIS professionals efforts in Pakistan towards the improvements of technological competencies in 21st century. *Global Knowledge, Memory and Communication, 73*(4/5), 596–613.

Soroya, S. H., & Ameen, K. (2020). Millennials' reading behavior in the digital age: A case study of Pakistani university students. *Journal of Library Administration, 60*(5), 559–577. https://doi.org/10.1080/01930826.2020.1772513

Ullah, A., & Usman, M. (2023). Role of Libraries in Ensuring Quality Education at Higher Education Institutions: A Perspective of Pakistan. *Inverge Journal of Social Sciences*, *2*(4), 13–22. https://doi.org/10.63544/ijss.v2i4.57

Zahra, M., Hanif, S., & Shah, S. A. A. (2024). Current technological trends used in libraries: A study of public sector universities of Khyber Pakhtunkhwa, Pakistan. *Journal of Development and Social Sciences, 5*(3), 87–99.