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RESEARCHARTICLE

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Impact of Electronic Resources on the Perception, Preferences, and Practice of Postgraduate Students in Academic Libraries

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Abstract
This study investigates the impact of electronic resources (e-resources) on postgraduate students' perception, preferences, and academic practices in academic libraries across 13 universities in Khyber Pakhtunkhwa (KPK), Pakistan. Using a quantitative research design, data were collected through structured questionnaires, yielding 800 valid responses from MS/MPhil and Ph.D. students. The findings reveal that e-resources are widely utilized for academic purposes, including literature reviews, thesis writing, and research publication development. Students reported that these resources significantly enhanced the quality and quantity of their scholarly work by promoting critical thinking and idea generation. However, the study also highlights persistent challenges, including slow internet speeds, lack of off-campus access, insufficient librarian support, and limited training in advanced search techniques. These barriers restrict optimal usage and indicate the need for robust IT infrastructure, continuous user training, and institutional support. The research concludes that while e-resources play a critical role in postgraduate education and research, systemic improvements are required to maximize their effectiveness. The study contributes to the literature by offering context-specific insights from a digitally under-resourced region and recommends targeted interventions to bridge the digital divide and enhance scholarly productivity.

KEYWORDS
Electronic Resources, Digital Libraries, Postgraduate Students, Academic Research, ICT Infrastructure, Information Literacy, Pakistan

1 |INTRODUCTION

Technological advancement has revolutionized the digital means to access databases so greatly that pertinent tools have become simply indispensable for an effective pursuit of knowledge. The digital database is a reliable source to access, retrieve, store, and disseminate information. Academic institutions seem to be bound to have well-developed tools and infrastructure to assist students and researchers in accessing quality academic content. Furthermore, Digital Libraries (DL) are now not only limited to the use of academic institutions, but governmental and non-governmental organizations have also started to rely on and use these resources to gain access to information. An overwhelming number of sources contain data tapped by scholars and students alike to carry out their research and fulfil their academic pursuits. E-learning has recently been used globally at educational institutes and universities as one of the most important and innovative tools. Chief purpose of e-learning is to make academic content available globally so that the benefit is seen significantly by people worldwide. Advanced countries have had been employing and exploiting e-learning sources efficiently. Therefore, most scholars prioritize e-sources to gain access to reliable information, latest research, and academic content. Researchers reliance on e-resources is because of authenticity of these sources, furthermore, easy access also remains one of the reasons for the same (Amjad, et al., 2013). Since students continue to embark on using e-resources, the volume of library material keeps on expanding simultaneously. Although e-resources are not only popular and deemed handy among students because of easy access to quality research data (Knight 2013). Also, information professionals with better computational skills are even more inclined to use e-resources. Institutes provide web services through

library web pages, whereas, other services are also provided including access to internet, electronic information sources, digital library and important sources of information including periodicals, books, research works, abstracts, teaching material, and patents are easily available via e-resources (Quadri 2012). Quality researches can be undertaken by utilizing digital resources resulting in reliable results. (Khan & Ahmed, 2016). Professional researchers as well as students (here 'student' indicates towards postgraduate students since they are the subject of this study) use e-journals to look for the relevant information online to conduct their research work. Majority of these data diggers rely on the use of search engines since search engines are easier to use and assist the researcher during the whole process of undertaking the job (Khan, 2012). Methods of traditional research have greatly been changed primarily because of revolution in the field of ICT as research scholars retrieve valid information using modern digital tools; the same retrieval tools are also used for storing information as well (Thanuskodi & Ravi, 2014). And these digital resources have made the whole process of retrieving information both easier and quicker. Electronic database resources are the primary choice even for the graduate students as most updated information is easily accessed (Owolabi, 2016) examines the use of e-journals by students and faculty members belonging to academic institutions. Faculty members of the academic institutions use e-journals in a different manner as compared to the students. This very difference is crucial in affecting the attitudes towards support services that are designed to promote the usage of e-journals (Bonthron et al., 2003). The prevalent e-information environment needs to be altered to fulfil the transformation of collection development as this has positive impact on users of libraries. Upgradation of IT infrastructure and proper maintenance of electronic information resources form the foundation of future of information services in academic libraries. (K. 2014). The access of information is very easy nowadays because of the internet, Magazines, new Internet has made access to information extremely easy today. An array of magazines, newsletters, scholarly journals, and documentaries etc. can be accessed within no time using internet. Technology has empowered scholars and researchers in a way that the data from all over the world can be accessed. This ease has paved the way for digital libraries as first preference of the researcher as compare to traditional libraries (Igun, 2005).

Literature Review

Majority of these studies have been carried out in educational setups involving students especially. Such as e-books, e-database, open access e-journals, and open access e-books have a clear link with the use of HEC digital library resources. Studies, furthermore, have revealed that younger student or researchers starting from 22 years old to 30 years old are more inclined to make use of HEC digital library as compare to researchers in their forties and fifties. Butt et al., (2011) stated that the behaviour of librarians working in Lahore, Pakistan in regard to use of internet has also been studied. Study revealed libraries in Lahore had easy access to internet. Furthermore, academic libraries were more equipped as compared to other kind of libraries. Most libraries provided internet access to both faculty members as well as other users. Moreover, library internet is mostly used to acquire information, to catalogue, and to perform functions regarding references. Although Pakistani libraries are equipped with internet but systematic and advanced assistance to help the users to make most out of the e-resources is missing unlike other developed countries (Rafi et al., 2018). Libraries lack planning, do not have systematic awareness campaigns regarding the use of e-resources, and rarely equip users with advanced skills to tap e-sources. Islam et al., (1970) examined that e-journals had become essential source of research. As almost every researcher tends to rely on an electric terrestrial portal to carry out their research, the demand for having access to e-journal has increased manifolds. Madondo et al., (2017) pointed out that 89% of the students were contented with the training pertaining to information literacy skills provided at the academic institutions as they were in a position to take full advantage of e-sources to carry out research, however, slow or unreliable internet connectivity limit their ability significantly to utilize such sources. Tlakula & Fombad, (2017) studied finding that awareness regarding e-sources was low and student usually confuse e-resources with web-based internet resources. Furthermore, the article suggests that the library training sessions should not be restricted to only one day rather informational instruction campaign should prolong throughout the academic season. One certain way to achieve this is to have this strategy imbedded in the list of strategic objectives of the universities or academic institutions. Igun (2005) investigated the ease to access information nowadays in shape of online availability of magazines, newsletters, scholarly journals, and documentaries. The internet, put simply, is a global system consisting of networks of computers through which one can access information from a computer, using a computer. A huge number of publications and academic manuscripts are available online. Encyclopaedic books have also been transformed into online version so that such books can be accessed with ease. Tens and thousands of e-copies of books from pretty much all academic fields of life are available on internet as well. Lenares (1999) discussed that e-journals made their way into ARL Directory of E-Journals in 1990s. There were only 27 e-journals in 1991, whereas, the total number of journals swelled to 45 in 1993. An incredible increase in the number of e-journals was observed in 1994 as the number inflated to

181. Up until 1997 there were 2459 e-journals. Editor, Freeman, & Nixon (2016) discovered that collection planning of University of California begun in 2003 and now over 90% of the collection there is in electronic form. Pretty much all the serials are in electronic form and the librarians are employing Demand-Driven Acquisition (DDA) and a significant planning is carried on specifying to access e-books. Arkorful, (2016) showed that majority of the students were having positive attitude regarding the use of ICT tools and were equipped to make efficient use of e-learning platforms. The whole process of learning has been revolutionized because of e-resources as students can access the learning material in their own language with utmost ease using digital resources. Quadri (2012) found that various types of library content such as books, patents, newspapers, photos, movies or music can now be provided in electronic or digital formats. From the user's point of view, e-resources can allocate time and space facilities, timeliness, the ability to directly search for text read more resources and link further information to digital resources like e-journal can be accessed via internet from any computer from anywhere and depending on the type of membership, one or more users can access the service at the same time, either directly through a free web-enabled PC or a proxy server (based on IP address-based access) to the local area network. The e-journal also facilitates full text downloading articles. Many electronic publishers provide their subscription to the library at a low cost. Ansari & Zuberi (2010) stated that Technology has entered all areas of life, and IT is in work methods and tactics. Libraries have been transformed into digital and virtual libraries, and books, periodicals, and magazines have been converted into e-books, e-magazines and e-journals to get better services and identify the needs of different users. E-resources deal with controlling the flood of information, its storage and spread latest information globally to increase its accessibility in remote areas. The academic staff and research scholars are satisfied using e-resources, but they face network problems. Mostly e-resources are used for research purpose and preparation of lectures. Chandra et. al. (2014) opined that most respondents are aware of e-resources and are using at university library. They can access e-resources for their acquiring and research. A maximum number of respondents believe that electronic resources are useful for research. Tajafari (2014) emphasized that e-journal plays a significant role in seeking the needs of researchers and to substantiate increases in budgets for acquisition of e-resources especially e-journals and for the effective execution of the collection, libraries should be accessible to the e-journal usage. According to Adeniran (2013) investigated study, researchers accomplished that electronic resources using have great influence on the undergraduate students' educational performance as well as they need improvement and more expertise in the use electronic resources. Studied results also show that mostly e-resources are used for research purpose, assignment, current awareness, emails, improve the library on the supply of library resources, to meet the educational needs of the university's undergraduate students. According to the study undergraduates' students discovered various factors when using e-resources, which include inappropriate information, large amounts of information, discovery results, slow downloading, to find out the relevant information or lack of search abilities, high-cost accessibility, unaffordability of some e-resources and complications in navigating through e-resource. According to Bansode (2013) conducted survey at the Institute of Scientific Research in India, that most students were aware of using e-resources and that they preferred electronic journals over printed one. Li et al., (2000) found in his study the increasing utilization of e-journals in the science communication process. At a very high percentage of (77.1%) are using a computer daily for word processing, programming and access of electronic mail as well as for Web. More than 55% these participants also using the computer for accessing e-Journal and print out e-journal weekly or once a month. Sathe et al., (2002) explored during the monthly studied period patrons have completed 99 of electronic and 90 surveys of print journals uses. Evaluation of the result shows that colleges' students and residents choose e-journals and teachers like print journals to use it for reading and scanning content. They print articles and hire e-journals to review references. According to his survey, approximately 80% of respondents believe that e-journals will reduce office confusion and promote the location of useful items, 74% are worried about the readability and portability of printed journals. EBSCO, (2018) research survey show that 45% of students using e-book for research purpose. Dillon, & Hahn (2002) pointed out in his survey that half of the faculty members and postgraduate students used e-journal. Kwadzo (2015) examined a study about the level of awareness and uses of e-databases by Graduate student at the University of Ghana. The study focus was on the Department of Geography, Developing Resources and Information Management The result shows that students are very familiar with the databases available to them because their usage indicators are 96.9% and 93.8%, respectively. Kwafoa et al., (2014) revealed that faculty member not only used online electronic resources for research purposes but also helping in their teaching area. Ndinoshiho, (2010) discussed that the use of the Internet and e-mail by the majority of students was discussed, and OPAC was used in relative use, although it was widely felt that e-databases were not being fully utilized. The study also showed that students use EIS for a variety of purposes, include obtaining course-related information, looking for a job, and patronages information, for entertainment and for communication purposes. Yebowaah & Plockey (2017) examined a survey on

usage of e-resources by lecturers of the University for Development Studies, WA Campus, Ghana. According to his results, 88.8% of the respondents are using Library and 65% were aware of the accessibility of e-resources in the library. This indicates that awareness is high, but the implementation is low.

Pakistan Universities Recognized by HEC and literacy rate

According to Statistics, (2018) Pakistan is the fifth most populous country in the world with a population of 207.774520 million. Finance Division, (2018) The survey stated that the literacy rate of the total population aged 15 (over who can read and write, is 57% (Male 60% and female 53%). According to the result of the current literacy rate, it means that half of our country is illiterate and contributes very little to the economic development of our country because the leading role is being made by education, and HEC recognizes, Pakistan has 189 universities, which are not enough for a populous country like Pakistan. In the world, Pakistani universities is very low. QUAID-E-AZAM University is the top university in Pakistan. In Asia, the top ranking number is 79th, and in the world ranking, it is between 401-500th . Rehman et al., (2015) stated that with the increase in security threats, families are always worried about sending their children to school. In 1972 and 1998, the literacy rate in KPK was 15.50% and 35.40%, respectively. In 2012, 2013, and 2014, it was 60%, 52%, and 53%, respectively. According to the latest reports, KPK's literacy rate is 50%.

Digital Library Development in Pakistan

The development of digital libraries in Pakistan has been a transformative initiative in the higher education landscape, strategically led by the Higher Education Commission (HEC) since its establishment in 2002. This transformation aimed to align Pakistan's academic infrastructure with international standards and enhance research capacity in a resource-constrained environment. At the core of this digital evolution lies the commitment to democratizing access to scholarly content, increasing academic productivity, and bridging the knowledge gap between Pakistani institutions and global academia (Shahzad & Khan, 2024). The foundational step in this development was the creation of the HEC Digital Library (DL). This national-level initiative grants access to over 75,000 full-text resources, including 20,000 peer-reviewed journals and more than 45,000 electronic books. The DL was envisioned as a repository of academic material and a digital backbone to support Pakistan’s transition into a knowledge-based economy. The initiative ensures that faculty, researchers, and students across public and selected private universities can access leading global databases such as Elsevier, Wiley, Springer, JSTOR, and IEEE Xplore.

Parallel to this effort, the Pakistan Education and Research Network (PERN) was launched to provide the necessary high-speed internet infrastructure, enabling digital library services. PERN connects higher education and research institutions through a broadband network that supports bandwidth-intensive academic activities, such as data sharing, remote conferencing, and access to cloud-based research tools. With over 56 institutions already linked and PERN-II under development to include an additional 59 universities, offering speeds of up to 10 Gbps, the digital backbone of academia in Pakistan continues to expand.

From a developmental perspective, digital libraries in Pakistan evolved through multiple phases. The first phase (2002–2007) involved content acquisition and infrastructure setup. During this period, HEC partnered with international publishers and negotiated national licenses, providing access to world-class academic databases at a subsidized cost. The second phase (2008–2015) focused on institutional integration, whereby universities were required to install campus-wide networks and user authentication systems, as well as train library staff in the management of digital content. The third phase (2016–present) is marked by digital maturity, user-focused services, mobile access, and integration of e-learning platforms and institutional repositories.

The benefits of digital library development have been substantial. Students and researchers have reported faster literature discovery, higher-quality research outputs, and increased publication rates in indexed journals. Faculty use digital resources to enrich curricula, stay updated with disciplinary trends, and supervise research more effectively (Batool et al., 2022). A recent study found that postgraduate students perceive digital libraries as not just tools of convenience but as integral to academic success and innovation (Shahzad & Khan, 2024).

However, developmental challenges persist. Infrastructure gaps, especially in remote and less developed areas, hinder equitable access. Inconsistent power supply, slow internet speeds, and lack of off-campus authentication systems disproportionately affect institutions outside major urban centers. Additionally, insufficient digital literacy among users and limited professional development for librarians have restricted the full utilization of these digital services. Librarians often lack the training to provide advanced database navigation or user instruction, thereby reducing the overall impact of these initiatives.

The HEC has introduced capacity-building programs in response to these challenges, including digital skills training for librarians and orientation sessions for faculty and students. Institutional repositories are also promoted to support open-access publishing and preserve local research output. Moreover, efforts are underway to integrate artificial intelligence-based discovery systems and multilingual search features to enhance accessibility and relevance.

In summary, the development of digital libraries in Pakistan represents one of the most significant policy successes in the country's academic history. From infrastructure to access, and user training to content curation, the national strategy has laid a strong foundation. Moving forward, sustained investment in digital infrastructure, inclusive policies, and targeted skill development will be critical to ensuring that digital libraries continue to empower Pakistan's academic community and fuel its research ecosystem.

The Significance of the Study

E-resources are regarded as a key component for scholarly interaction and their use in the educational environment. Researchers need to explore this further. The outcomes of this analysis will contribute to understanding the use of electronic resources, the level of user-friendliness, and the purposes for and obstacles to retrieving them. The results of the study will be valuable for improving applicable instructional platforms for universities. Additionally, the recommendations from this study will be helpful for library management, planners, and librarians who administer these resources. Moreover, the results can also aid in developing a deeper understanding of the information needs of users of e-resources. Most previous studies are based on digital library (DL) development, focusing on plans for digitization, implementation, budget constraints, and recommendations for future projects. The unique aspect of the present study reveals the purpose and usage of e-resources for academic progress, the impact of using e-resources on user performance, and the challenges faced while utilizing e-resources at the university level. This is the first detailed study conducted in the Peshawar KPK region, as no such research has been carried out before.

The Education Landscape

The education sector is under tremendous pressure in the district. The quality of education is a persistent issue, with many schools often lagging. Statistics show 1060 primary schools, 155 middle schools, 140 secondary schools, and 32 higher secondary schools in the district of Peshawar. The estimated Teacher-Student Ratio is 1:45 at the primary level, 1:70 at the middle level, 1:32 at the secondary level, and 1:27 at the higher secondary level. Despite being the provincial capital and seat of government, Peshawar missed two Millennium Development Goals (MDGs), "Achieving Universal Primary Education by 2015" and " Promoting Gender Equality and Women Empowerment. " While the urban literacy rate (62 %) is higher than the rural literacy rate (45 %), the Gross Enrolment Rate (GER) is 91 %, and the Net Enrolment Rate (NER) is 56 % at the primary level.

The Objectives of the Study are:

1. To identify the purpose of using e-resources.
2. To analyze the impact of using e-resources on users' performance.
3. To pinpoint the usage of e-resources by the users for their academic progress.

To explore the challenges faced by users while using e-resources.

2 MATERIAL AND METHOD

Data Sources

Our research population consisted of postgraduate students (MS/M.Phil. and Ph.D.) research scholars from 13 universities across the province. We conducted a pilot study before distributing the research questionnaire to enhance its development, improve respondents' convenience, and examine the factors that affect user preferences and loyalty toward e-resources. The questionnaire contained two parts. The first part collected demographic information from respondents, including their educational level and frequency of e-resource use. The second section was designed based on the theoretical constructs discussed earlier to measure user engagement and loyalty. The final research questionnaire was distributed in printed form among 1,000 respondents, and we received 800 completed responses; thus, the entire process took three months.

Data Analyze

Descriptive statistics were used to analyze demographic data, along with t-tests to describe the basic features of the study's data. A convenience sampling technique was employed to gather the desired data from respondents through a structured questionnaire based on the Likert scale. Data were analyzed using SPSS software version 23, and a simple t-test was applied to examine the data.

Finding

Demographics

I initially distributed 1000 questionnaires after gathering data from all respondents. Did I verify if they filled out the questionnaires completely? Upon cleaning the collected data, I discovered that some respondents had selected multiple responses for the same question, such as ticking both' Agree' and' Strongly Agree. 'Additionally, some participants left specific questions unanswered. To prevent any bias, I excluded these incomplete responses, resulting in a final total of 800 valid responses for statistical analysis. Among these, there are 164 Ph.D. students and 636 MS/M.Phil. Students, totaling 800 respondents, are illustrated in Fig. 1.

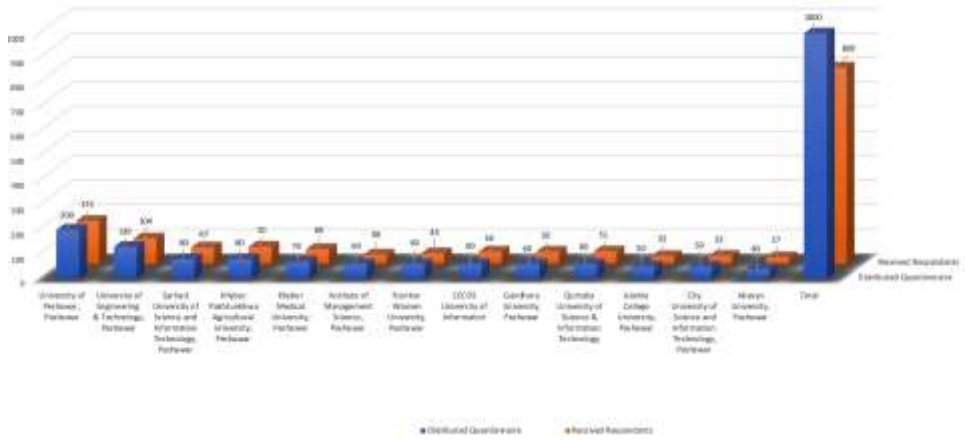

Fig. 1: Respondent as per the university

Table 1

Ranked	Purpose	Df	Mean	Sd	Sig
1	To track and access electronic abstracts of academic journals	799	4.00	0.818	0.000
2	To fulfill coursework and assignment requirements	799	3.67	1.274	0.000
3	To retrieve and review articles from electronic databases for publication purposes	799	3.53	1.548	0.000
4	To conduct topic-specific literature reviews	799	3.53	1.492	0.000
5	To draft and develop a research article	799	3.49	1.527	0.000
6	To complete the writing and submission of the thesis	799	3.16	1.121	0.000

Note: The Significance value is acceptable at (P<0.05)

Fig.2: Frequency Distribution of Using E-resources.

Fig. 2 illustrates the frequency of electronic resource usage among respondents from 13 universities. Specifically, 28.125% of respondents access electronic resources daily, 36.375% utilize them 2-3 times a week, 21.375% every week, 6.25% monthly, and the remaining 07.5% use these resources as needed.

Objective 1: Purpose of using E-resources

After analyzing the data from the objective in Table No. 1, a high mean for individual variables such as completing coursework, publishing articles in an e-database, reading relevant topics for writing research articles, and completing a thesis is significant (P<0.005). Furthermore, the T-value of the individual variable (0.000) indicates a higher level of significance observed in the dataset presented in Table 1. Additionally, we analyzed the mean and standard deviation (SD) of each observation in Table 1, which reveals a high mean value of 4.00, confirming that students utilize e-resources for tracking journal e-abstracts. Mean values between 3.67 and 3.87 marginally surpass 3, aligning with the median of the five-point Likert scale (strongly agree to disagree strongly). Our study result is in line with (Wu & Chen., 2012) analyze the purpose of using e-resources. Students frequently use e-resources and consider them imperative to their studies and research work. They report that most of the documents they need are in digital format. Without the Internet, libraries are often the first and primary source for students seeking records related to their research.

Objective 2: Impact of using electronic resources on the performance of users

The results analyzed in Table 2 indicate that the mean values of individual variables, such as using e-resources to generate new ideas, content updating, standardization of academic research in terms of quality and quantity, and users' expectations, are significant (P<0.005). Additionally, the T-value of the individual variable (0.000) reveals a higher level of significance observed in the dataset presented in Table 2. Furthermore, we analyzed the mean and standard deviation (SD) of each observation in Table 2, which shows that the mean (2.39) to mean (3.87) was a little bit above 3, resembling the median of a five-point Likert scale (1-strongly agree to disagree strongly). In

connection with the utilization of digital resources, many researchers, including Dukić and Strišković (2015), have observed their increasing importance and enduring impact on academic research. According to Owolabi (2016) study, it was disclosed that 78.2% of students worldwide have access to electronic resources for updated information, which aligns with the results of our research.

Objective 3: To identify how users utilize electronic resources for their academic progress.

The results analyzed in Table 3 demonstrate that the mean values of different variables, such as using e-resources to access a wealth of information and various media that cannot be presented in print, are significant (P < 0.005). Additionally, the T-value of a single variable, 0.000, reveals a higher level of significance when analyzed within the dataset in Table 3. Furthermore, we analyzed the mean and standard deviation (SD) of each statement in Table 3, revealing that the means of 4.50 and 4.23 are quite high, corresponding to the median of a five-point Likert scale (1 - strongly agree to 5 - strongly disagree). Borgman et al (2005) demonstrated a notable rise in users engaging with research activities via electronic resources. In this study, respondents (mean value=4.50) and (mean value=4.23) from all universities concurred that utilizing e-resources allows them to discover various materials in one location, including e-books, printed journals, e-journals, digital libraries, institutional repositories, websites, and audio-visual animations, which cannot be entirely replaced by print. Primarily, students acknowledged that e-resources provide access to a broader array of up-to-date information, thereby enhancing the quality of research.

Objective 4: **The challenges faced by users while using electronic resources**

The Challenges Faced by Users While Using Electronic Resources

Several obstacles were highlighted by respondents when using e-resources. The results depicted in Table 4 indicate that the mean values of individual variables, such as low internet speed decreasing user access, inaccessibility outside the university affecting users' research activity, insufficient librarian assistance in using e-resources, lack of training or orientation for utilizing e-resources, and limited knowledge about advanced searching techniques, are significant (P<0.005). Moreover, the T-value of the specific variable (0.000) reveals a higher level of significance, as analyzed in the data set presented in Table 4. Additionally, we analyzed the mean and standard deviation (SD) of each statement in Table 4. The analysis of organized data shows that most students across all universities (mean value = 4.02) encounter issues due to slow internet connectivity. They face difficulties while downloading or searching for relevant data. The majority of our respondents, with a mean value of 3.85, identify the significant problem of lacking access to most journals when they are off-campus or outside the university library, which affects their research activities. A mean value of 3.14 indicates that respondents noted a lack of a critical mass of library staff trained in using electronic resources to assist them in searching for necessary information from those resources, which has led to their limited use of such resources. The same problem, lack of knowledge, was also discussed by Jabeen et al., (2017; Wu & Chen (2012) mention the same problem: the inability to retrieve relevant material when searching by keywords and using numerous database search methods, because they lack experience with certain database coverage. According to Tajafari (2014) Results show that most research scholars face problems with not using e-journals due to a lack of time to explore and locate them, insufficient subscriptions in their field, poor connectivity, inadequate internet facilities, and a lack of assistance from librarians.

Table 2

Ranked	Impact	Df	Mean	Sd	Sig
1	e-resources inspire me with new ideas and encourage further research	799	3.87	0.932	0.000
2	Enlighten regular updating of content	799	3.63	1.353	0.000
3	Facilitates and increases the quality of research work	799	3.57	0.974	0.000
4	Facilitates an increase in the quantity of research work	799	3.51	1.366	0.000
5	Expect to use in the future	799	2.39	0.895	0.000

The Significance value is acceptable at (P<0.005)

Table 3

Ranked	Usage	Df	Mean	Sd	Sig
1	I use e-resources to find many e-resources (e-books, Print Journals, e-journals, DL, institutional repository, websites, and other resources) in one place.	799	4.50	1.112	0.000
2	E-resources can contain vast information and miscellaneous media that cannot be placed in print.	799	4.23	1.391	0.000
3	E-resources have to access a broader range of information	799	2.95	1.346	0.000
4	E-resources Keep yourself up-to-date with information	799	2.89	0.951	0.000
5	Access to quality information through e-resources, as a result, academic performance is improved	799	2.85	0.500	0.000

The Significance value acceptable at (P<0.005)

Table 4

Ranked	Challenge's	Df	Mean	Sd	Sig
1	Low speed of the internet decreases users' access	799	4.02	1.116	0.000
2	Not being accessible outside of the university affects users' research activity	799	3.85	1.326	0.000
3	Not enough librarian helps me to use e-resources	799	3.79	1.258	0.000
4	Lack of training or orientation to use e-resources	799	3.14	1.255	0.000
5	Lack of knowledge about advanced searching techniques	799	3.14	1.017	0.000

The Significance value acceptable at (P<0.05)

4 | DISCUSSION

This study contributes to understanding how Khyber Pakhtunkhwa (KPK) postgraduate students perceive, prefer, and utilize electronic resources in academic libraries. The findings reveal a clear trend: e-resources are now central to the academic workflow of postgraduate researchers. Most respondents reported frequent use of digital resources—over 64% access them daily or multiple times per week—suggesting that these tools are no longer optional but essential. These findings align with global research, including studies conducted in East Asia and sub-Saharan Africa, which emphasize that digital access fosters academic efficiency and democratizes knowledge availability (Makhafola et al., 2025).

A notable observation is the multidimensional purpose for which e-resources are used. Students rely on them for coursework, literature reviews, publication development, and thesis writing. The digital environment enhances their exposure to cutting-edge knowledge, enabling them to track scholarly trends and engage with current debates. The positive impact of e-resources is further underscored by the fact that many participants acknowledged that digital tools inspired new research ideas and improved the quality and volume of their academic work. Such outcomes resonate with the work of Khan et al., (2014), who emphasize that digital literacy empowers learners to access and critically engage with scholarly materials, thereby enhancing their academic output and self-efficacy.

However, while the benefits are evident, the study also exposes critical barriers that hinder optimal use. Chief among these is infrastructural inadequacy, particularly the problem of slow internet connectivity, which received the highest mean score among the reported challenges. This issue restricts access to digital databases and often disrupts the research process. Moreover, many students noted the absence of off-campus access to e-resources. In a time when flexible and remote learning is increasingly prioritized, such limitations are detrimental to equitable access. These infrastructural deficiencies mirror those identified in similar studies across Pakistan and other developing nations, where the digital divide continues to constrain academic progress (Khan et al., 2014). Another issue identified in the study is the lack of training and institutional support for using e-resources. Although postgraduate students are generally familiar with digital databases, many lack the skills for advanced search techniques and effective navigation of complex platforms. This competency gap limits their ability to fully benefit from the available information. Makhafola et al. (2025) similarly argue that mere access to resources does not guarantee meaningful engagement; students must also be equipped with the cognitive and technical skills to exploit these resources productively. The current study affirms this argument, highlighting the urgent need for structured training initiatives and a proactive role by librarians and academic staff in facilitating resource utilization. Furthermore, the study reveals that a significant proportion of students are dissatisfied with the level of support provided by library staff, especially regarding guidance in database usage. The presence of knowledgeable library personnel is pivotal to creating a supportive digital research environment. Without such support, students may become overwhelmed or disengaged, ultimately diminishing the impact of e-resources on academic performance.

Conclusion

The findings of this study affirm that electronic resources are indispensable tools for postgraduate students, profoundly influencing their academic practices and research outcomes. These digital tools are widely used for accessing scholarly journals, conducting literature reviews, drafting manuscripts, and enhancing academic performance. Students report high levels of satisfaction with the breadth of information available and the ability of these resources to stimulate innovative thinking and deeper engagement with research topics. However, despite these strengths, the effective use of e-resources is constrained by several systemic challenges.

Among these are infrastructural limitations such as slow internet speed, limited off-campus access, and inadequate librarian support. These issues diminish the transformative potential of e-resources and restrict their full integration into the academic routine. Moreover, insufficient training in digital search techniques further impairs students' ability to utilize e-resources effectively. If left unaddressed, these challenges risk widening the educational inequality gap and stifling research advancement in regions like KPK.

Thus, to fully leverage the potential of digital resources, academic institutions should invest in creating a well-developed IT environment, provide secure access not only on campus but also off campus, expand their digital training, and ensure that library specialists are well-trained and able to assist students. Worked comprehensively, such steps can help students' research skills improve significantly and increase the academic level of the institutions. Although this research is valuable in certain respects, it is essential to consider the limitations of the study. To begin with, the study has a geographical restriction as it focuses on universities in Khyber Pakhtunkhwa. Therefore, the results are unlikely to be used elsewhere in Pakistan or beyond. The low institutional funding, infrastructure, and digital policy at the provincial level may result in deviations in use patterns and problems. Second, self-reported data collected in the form of structured questionnaires may have introduced bias, potentially leading to overreporting of digital literacy skills or underreporting of challenges, as respondents may have sought to present themselves in a favorable light.

Third, the cross-sectional design of the study does not permit observation of trend across points and the effects of long-term use of digital resources on academic performance. Fourth, the study lacked input from other vital stakeholders, such as faculty members, librarians, and administrators, whose responses would have provided a broader overview of the institutional readiness and support systems for users. Finally, only quantitative methods were used in the study, and as such, the study would not have achieved the depth of a qualitative research done using interviews or focus groups. Future studies should be more comprehensive than the current study to enhance outcomes and address the limitations noted in the current study. Longitudinal research may provide a dynamic picture of the trend in using digital resources, particularly due to changes in infrastructure or training interventions. Best practices and regional variations in the adoption and access to e-resources can also be detected through comparative research conducted in various provinces or countries.

Adding experts, such as faculty, librarians, and IT staff, to the picture will also improve our understanding of the system properties that facilitate or hinder the utilization of digital resources. Case studies in the future may also provide further literature on the effectiveness of digital literacy programs by assessing pre- and post-training user skills of competency. As more artificial intelligence and machine learning are being used in digital libraries, examining their effects on research practices and academic outcomes among graduate students would be interesting. Furthermore, qualitative research methods will be employed to identify subtle user experiences, motivations, frustrations, and preferences, including in-depth interviews, case studies, and ethnographic approaches. Within the current trend in higher education (including institutions) to move toward blended and remote learning conditions, particularly due to the COVID-19 pandemic, it is quite possible that by examining the long-term digital adaptation approaches of universities, critical information can be extracted that can be used in both policymaking and practice.

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