Assessing the Factors Affecting E-Resources Acceptance among Postgraduate Students of Punjab, Pakistan

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Abstract

This study combines the internal components of the Technology Acceptance Model (TAM) with variables including awareness, influencers, training modalities, and technology to measure research scholars' acceptance of electronic resources. Data were gathered from postgraduate students at three public universities in South Punjab, Pakistan, using a cross-sectional survey. To analyze the data, structural equation modeling (SmartPLS v4.1.1.2) was employed. The results of our study showed that the adoption of e-resources is significantly influenced by external factors when the Technology Acceptance Model (TAM) is considered. All of the study's hypotheses were validated, and the results showed that behavioral intention to utilize e-resources is positively correlated with awareness, training, influencers, and technology, which all significantly impact perceived ease of use. This study will make a substantial contribution to the literature from developing nations and will be beneficial for librarians, developers, policymakers, HEC officials, and university libraries when designing e-resources to increase their acceptance.

Keywords: Electronic resources, Behavior intention, TAM, Extended TAM, Digital resources

Introduction

The proliferation of literature in the knowledge-based economy has sparked a technology revolution and advancement in information and communication technology (ICT) solutions, which has led to the introduction of novel and inventive goods and services such as electronic resources (Makori, 2016). In the era of digitalization, e-resources and products dominate every aspect of daily life. Mobile gadgets, including computers, tablets, and smartphones, are

commonplace for people to use for employment, education, and recreational purposes (Ko *et al.,* Wang *et al.,* 2016). In addition, the average individual in the world uses network-connected electronic gadgets for 3.23 hours a day (Young 2017). However, some parents employ interactive smartphone applications (apps) to hold their kids' attention as they study and use technological resources to encourage their kids to read and learn (Sung and Chiu, 2021). Comparing printed materials to electronic resources yields several benefits, including more up-to-date information and anytime, anywhere accessibility (Yip *et al.,* 2021).

The entire architecture of libraries will change as Pakistan and other developing nations grow more technologically proficient (Lwoga and Sangeda, 2019). The design of libraries is changing due to e-resources, as evidenced by the current patterns of content distribution, organization, acquisition, and access via electronic means. Additionally, e-resources can offer a variety of learning opportunities and collaborative multimedia capabilities (Booker *et al*., 2012). Instead of going to a typical library, users may discover and obtain pertinent full-text content with ease by using e-resources. HEC national digital library provides the biggest platform by offering 75000 electronic contents that are available online to meet the information needs of Pakistani researchers. Users can explore or search based on the information they need. They can explore or search by selecting a specific database or by using the entire digital library (HEC Digital Library, 2020).

Students, researchers, and academics are using e-resources more frequently. The Higher Education Commission (HEC) incurs significant expenses for access to educational institutions and e-resource subscriptions. A variety of factors both encourage and negatively affect the usage of e-resources. It is imperative to investigate the factors influencing research scholars' use of e-resources to boost their use by research scholars (Research students are postgraduate students who must prepare a dissertation as part of their program requirements). Research scholars are using e-resources for research-related tasks such as publication, writing articles, preparing assignment work, seminars, and knowledge retention. Numerous factors affect research students' utilization of e-resources. The goal of this study is to gain a better understanding of the variables influencing research students at public universities' use of e-resources. In addition, universities will be able to overcome the obstacles that prevent using e-resources. Furthermore, by

determining the influential elements that support the higher utilization of e-resources by research students, this study will offer recommendations for both public and private university libraries.

Research Objectives

1. To describe factors affecting the acceptance of e-resources
2. To extend the technology acceptance model (TAM).
3. To validate the developed model.

Literature Review

Utilization of electronic resources is essential for postgraduate students to achieve academic excellence. University libraries, teaching hospitals, public libraries, and charitable organizations can all benefit from using electronic resources to achieve positive outcomes (Rafi *et al.,* 2019). Academic libraries have long been important because they provide vital information that contributes to the social, political, and cultural advancement of any society (Posner, 2019). Electronic resources serve as a gateway to content available online. According to Soroya and Ameen (2020), the literature demonstrates that information consumers are voluntarily moving to electronic books. Due to technological advancements, libraries are moving their services and resources from physical to electronic formats because these resources are gaining popularity and assisting libraries in saving their users' time by giving up-to-date knowledge.

According to research, libraries spend over 70% of their budget on purchasing electronic books because of their advantages and growing demand from patrons. Yet according to Bashir *et al.*, (2019), Indian consumers use e-resources since they are more convenient and easier to access around the clock, timesaving, and effort-free. Kinengyere, (2007) investigated that the acceptance of e-resources is significantly influenced by lack of information literacy sessions. In addition, awareness of e-resources and training sessions has a significant role on adoption of e-resources (Aderibigbe and Ajiboye, 2013). Another study by Ankrah and Atuase (2018) found that many Ghanaian students use Yahoo and Google rather than university-subscribed e-resources for their academic work. In this way, a significant portion of students were not aware that e-resources existed(Haridasan and khan, 2009; Letchumanan and Tarmizi, 2011).

Likewise, Zhang *et al*., (2011) conducted a survey among chemists, biochemists, and biologists and determined that the use of electronic resources was significantly influenced by awareness. Training has been recognized as a crucial component needed for the efficient use of electronic resources and aids users in becoming aware of their features and searching methods. Subsequently, Emwanta and Nwalo (2013) implies that students were unable to navigate e-resources since they are not trained. In a similar vein, Fidzani, 1998; Egberongbe, 2011; Manda and Mukangra, 2007) discovered that students remain unaware of library's subscription databases because of insufficient instructions and guidelines.

Most students in this information era use internet resources independently, however, influencers like colleagues, educational professionals, and library workers are crucial in spreading awareness about the usage of e-resources (Swain and Panda, 2009). Students and research scientists tend to seek help from their peers when needed. Consequently, friends, teachers, and library employees have a substantial influence on encouraging the use of e-resources (Kumar and Batra, 2018; Kumar and Kumar, 2010). Furthermore, peers and social networks, such as friends, family, and coworkers, have an impact on an individual's behavior to use e-resources (Ali, 2005). Hence, Soroya and Ameen (2018) claimed that university students in the future will likely want quick access to the internet while attending classes. Similarly, according to Angelo and Wema (2010), the primary cause of the neglect of e-resource acceptance is the absence of IT infrastructure and technology necessary for e-resource access and application.

Moore (2015) found that students find e-resources easy to handle and straightforward to take advantage. Corresponding to this, Kumar and Batra (2018) found that students favor e-resources because of their user-friendliness and well-structured information. state that students conduct research using online resources. Lwoga and Sukums (2018) examined the e-resources usage behavior of health sciences faculty and found that they use e-resources for research purposes, and they will continue it in the future if the system provides effortless information. Likewise, Lwoga and Sife (2018) reported young faculty members' positive intention towards e-resources and reported that e-resources save time, deliver relevant information, update knowledge, and improve academic performance. Additionally, Ankrah and Atuase (2018)

revealed that students prefer to use e-resources for their assignments and research work. Similarly, Jabeen *et al.,* (2017) examine that University students use e-resources to accomplish their course work, research papers, theses, and dissertations. Likewise, Bhat, (2019) confirmed that e-resources increases academic performance of students in terms of timely completion of assignments, and competitive examinations.

Theoretical Framework and Hypothesis Development

The theoretical foundation of the study is TAM, developed in 1989 by Davis to explain why users adopt a certain technology. TAM's efficacy has been demonstrated in a number of technological acceptance tests. To better explain the adoption of varied technologies, the inclusion of new components to the model has resulted in numerous modifications and advancements regarding the usage of digital resources in TAM. A study that expands TAM factors looks at students' usage intention of e-resources for academic purposes. The results of the study show that students' attitudes toward accessing e-library resources are significantly impacted by several factors of basic and extended TAM, such as accessibility, attitude, perceived usefulness, and perceived ease of use (Ternenge and Kashimana 2019).

In the present study, we made a substantial contribution to the literature by extending the TAM in e-resources contexts, as explained in the literature review. Therefore, the primary goal of this study is to evaluate how these factors impact the adoption of e-resources.

Training Modes

The phrase "training modes" describes the range of techniques and strategies used to provide instruction and training to individuals or groups. It has been demonstrated that training is important for assisting users in using e-resources efficiently (Ali, 2005). The institute offers instruction through a variety of channels, including online portals, experts, academics, and library personnel. Providing educational resources is no longer the main objective of library instruction and training; instead, practical classes are being taught to become lifelong learners (Frandsen *et al*., 2017). Prior research has indicated that the training modes have a substantial impact on the ease of use of e-resources (Aderibigbe and Ajiboye 2013). The ease of use and usefulness of e-resources can be influenced by the training modes (Yebowaah and Plockey 2018). Similarly, users are unable to understand the ease of use and the usefulness of e-resources

without training (Kim, 2017). Likewise, students need to receive training to effectively search for information as well as gain a thorough awareness of the characteristics and advantages of e-resources. Additionally, students attempt to acquire knowledge about e-resources through a variety of official and informal training methods. Furthermore, in the new age of technology users prefer to take guidance from their friends, colleagues, and teachers to use e-resources, training modes are also influenced by influencers (Swain and Panda, 2009). Based on the indication from previous studies, we suggest the H1, H2, H3.

Influencers

Influencers are people or groups who have made a big impact or grown in importance in the online learning and digital content domains within the context of e-resources. In the same way, the environment that is shaped by influencers, such as educators, librarians, teachers, and friends, play a positive impact on awareness. Like awareness, influencers' e-resources might occasionally be disorganized that it is challenging to obtain information without assistance from a human (Tahir *et al.*, 2010). In the era of information technology, students use e-resources mostly on their own. They do not go to influencers for assistance; in a research study students claimed that they will use e-resources if their teachers guide them, further they rather turn to their friends for assistance if needed (Swain and Panda, 2009). Students do not prefer to use e-resources because they consider it difficult due to lack of awareness, Moreover, they claimed that influencers may become a source of quick, timely and reliable help (Liu, 2004). To create a favorable atmosphere for the acceptance of e-resources among students, cooperation amongst various influencers is essential.

Awareness

The degree of user familiarity with the availability of e-resources is indicated by awareness, it means being knowledgeable about the different types of e-resources that are available in the institution. It is about how to effectively search for information online, navigate digital libraries, access to e-books or online articles, and use online databases for research purpose (Ali, 2005). Being aware of e-resources can greatly enhance students' ability to find and use knowledge in the digital information age. Universities struggle to defend the expense of e-resources against utilization because of a lack of awareness about how important it is to use them

(Harlow and Hill, 2020). According to a study on postgraduate students from seven colleges, awareness was a major factor in influencing acceptance of e-resources (Aderibigbe and Ajiboye, 2013). In addition, students begin using search engines rather than paid e- resources to fulfil their informative needs (Bhat, 2019). The PEOU and PU of digital textbooks are significantly improved by stated awareness. Students' perceptions of e-resources' usability and simplicity of use would be favorable if they were aware of them, and they would quickly embrace them. Based on that, we hypothesize H7, H8.

Technology

Technology is the most critical factor that plays a very important role in using e-resources. This factor comprises of four variables related to the library website, IT infrastructure, and remote access, such as username/passwords, internet connection, usability of labs, VPN for remote access, reliability of computer networks, information on library websites and IT Infrastructure. Previous research has also found that use of library web interface was one of the factors which influence e-resources acceptance (Ibrahim, 2004). Technology is the most critical factor that highly influences perceived ease of use and perceived usefulness of computer system (Millawithanachchi, 2012). Internet access found to be one of the most important tools for accessing e-resources (Habibi *et al*., 2019). It is further mentioned that most students were not aware of the available technological tools including Wi-Fi, usernames, passwords, and labs and majority of them declared that they would use labs if it would be easy and useful for them. As a result of their lack of knowledge, the students did not use technological resources (Swati and Rupanagudi, 2020). Based on the confirmation from earlier studies, so we propose H9 and H10.

Perceived Usefulness

According to TAM, the most important factors influencing the adoption of IT in institutions or companies are PU and PEOU, which characterize actual behavior. These two ideas encourage the use of any system or technology. "PU is about the belief of individuals about the particular technology that encourages them to use it to increase their work productivity (Davis, 1989). Users will be more inclined to use e-resources if they understand how simple and beneficial the learning materials are. PU significantly affects BI, according to numerous studies that were founded on the literature on e-resource acceptability.

H11. PU has a statistically significant influence on PEOU of e-resources acceptance.

Perceive Ease of Use

When individuals think that adopting a specific technology will be free of limitations and labor-intensive is known as perceived ease of use (PEOU). TAM implies that BI has an effect on PU and PEOU (Davis, 1989). A key element of technology acceptance in a range of information systems is PEOU. Students' behavioral intention to use e-resources in a given situation may rise if they believe they are easy to use (Borrego et al., 2007). According to Mashaba and Pretorius (2023), the primary reason for using e-resources is their ease of access. Postgraduate students will not use the e-resources if it is difficult to locate and download the required article. PU and PEOU are the most important factors that influence the adoption of IT in institutions or companies. These two ideas encourage the use of any technology or system. Additionally, PEOU has a positive result on PU. Hence, we hypothesized H12 and H13.

Behavioral Intention to Use

Davis (1989) defined behavioral intention (BI) as an individual's desire to carry out a particular behavior. However, according to research results by Muhammadi (2015), there is a considerable correlation between BI and the acceptance and use of a certain technology. BI is the most accurate measure of a system's real-world usage, according to both the theory of reasoned action (TRA) and the theory of TAM (Davis, 1989). E-resources-related research has demonstrated that BI positively affects the real use of e-resources. According to Tomney and Burton (1998) and Kim et al. (2007), BI is also regarded as the crucial TAM element for analyzing the students' adoption of e-resources.

***H1*:** TMR has statistically significant influence on the PU to use e-resources.

H2: TMR has a statistically significant influence on PEOU to use e-resources.

H3: TMR has a statistically significant influence on INF to use e-resources.

H4: INF has a statistically significant influence on AER to use e-resources.

H5: *INF* has a statistically significant influence on PU to use e-resources.

H6: *INF* has a statistically significant influence on PEOU to use e-resources.

***H7*:** AER has a statistically significant influence on PEOU to use e-resources.

***H8*:** AER has a statistically significant influence on PU to use e-resources.

***H9*:** TAE has a statistically significant influence on PEOU to use e-resources.

***H10*:** TAE has a statistically significant influence on the ASU of e-resources.

***H12*.** PEOU has a statistically significant effect on BI on e-resources acceptance.

***H13*.** PU has a statistically significant effect on BI e-resources acceptance.

H14. BI has a statistically significant influence on actual system use of e-resources.

Extended TAM model with new theories awareness (AER), training modes, (TMR) Influencers (INF) technology (TAE) Usefulness (PU) and Perceived ease of use (PEOU) shown in **Figure 1.**

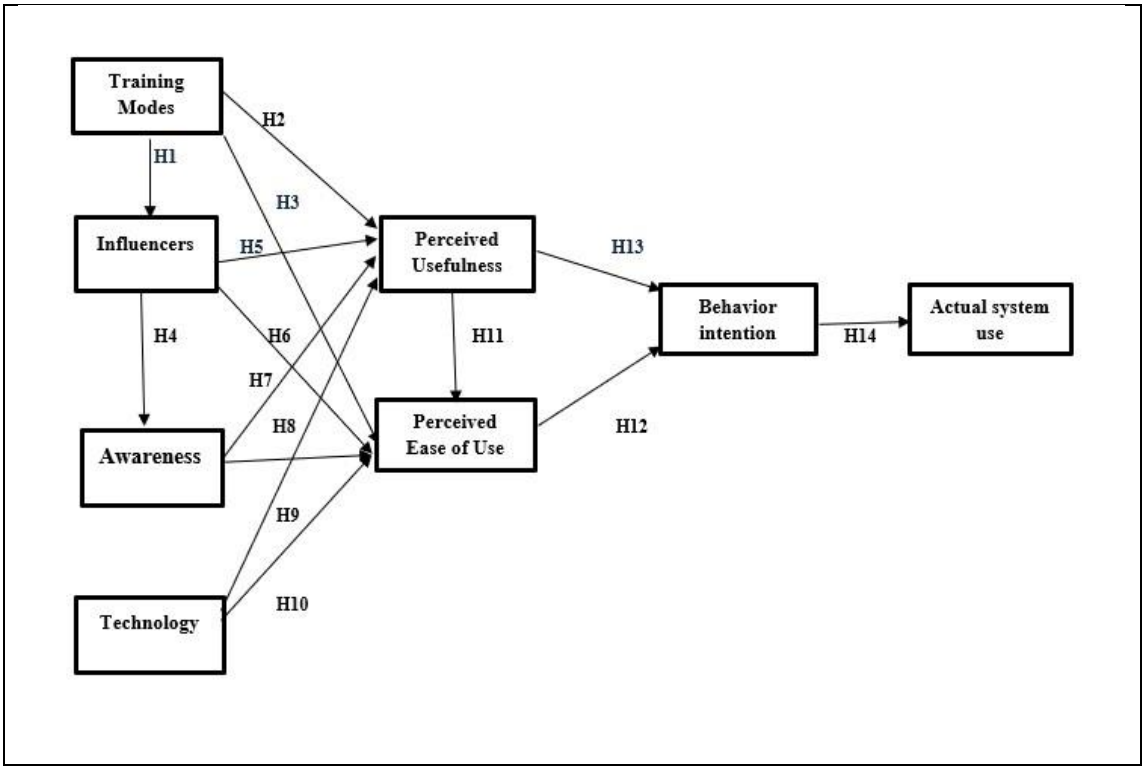

Figure 1: Research Mode

Methodology

To evaluate our theoretical model, we employed a structured questionnaire with three different parts. The questionnaire is divided into two sections: the first part assesses the participant demographic data, and the second part examines the constructs that are part of the study model. A five-point Likert scale was used to score the constructs' items, with the options

ranging from "strongly disagree" (1) to "strongly agree" (5). Every construct that was developed from the literature was intended to benefit from well-researched quantitative measurements; these measures came mostly from previously conducted survey instruments (Straub, 1989). Most of the constructs were put into practice by altering previously approved scales. The factors such as; perceived usefulness, perceived ease of use, behavior intention and actual system use were modified from basic TAM model. While the awareness, training modes, and influencers were adopted from the previous studies (Zhang *et al.*, 2011; Wu and Chen 2012; Aderibigbe and Ajiboye 2013; Ukachi 2015; Ali 2005; Swain and Panda 2009; Kumar and Kumar 2010), the scale items for ‘’technology’’ were adapted from the (Millawithanachchi, 2012). The questionnaire consisted of 32 questions that addressed the factors included in the research model. To determine the design's feasibility, subject matter experts—two academics from three different institutions and one chief librarian conducted and assessed pilot testing. As the required changes were being made, the expert recommendations were taken into account. Pilot testing was carried out before the questionnaire was distributed; 25 research students from IT departments of the sampled universities were chosen randomly for this purpose. Before beginning the data collection procedure, we revised the instrument based on their suggestions.

To certify a high level of consistency and clarity, the researchers used a set of certain keywords such as “PU” “perceived usefulness”, “Perceived Ease of use”, “PEOU”, “Behavior intention”, "BI", “ASU”, "Actual system use”, “AWR”, "Awareness”, “TMR", " Training Modes", " Influencers", " INF" and “Technology for accessing e-resources", "TAE".

The questionnaire was considered very easy to gather data from a large population makes it highly valuable. The study's target population consisted of all IT MPhil and Ph.D. postgraduate students currently enrolled in sampled Universities. It is noteworthy to add that 434 students were registered overall during the data-gathering process, according to figures obtained from the computer science faculties of three universities that were sampled. For data collection students' email addresses were gathered from the concerned departments, we provide the link to the online survey to collect data. In addition, a printed version of the questionnaire was also provided, in case of the absence of no contact information. The responders were given the guarantee that their data would be kept secure and used exclusively for study. The entire data collection process

spans three months, from September to November 2023. According to the sample size, the principal investigator personally circulated and gathered questionnaires from students to obtain a high response rate. Throughout the data collection process, the researcher was very accessible and gave the students information on her questionnaire. We received 306 valid responses from postgraduates representing a 93% response rate. Partial Least square (Structure equation modelling) was used to analyze the factors based on the collected data (PLS-SEM).

Data Analysis

PLS-SEM was carried out with SmartPLS it is useful, especially for exploratory research and formulating hypotheses Hair et al., (2014) As per the findings of the respondents' demographic profile (Table 1), 53.4% of the respondents were men and 46.6% were women. The age group showed that 29.8% of the respondents were between the ages of 21 and 25. When it came to educational background, the majority of respondents 70.3% had an MPhil in LIS, while 29.7% held a Ph.D.

Table 1: *Demographic results*

Characteristics	**Values**	**Frequency**	**Percentage**
Gender	Male	161	53.4
	Female	145	46.6
Age	21-25	127	41.6
	26-30	93	30.5
	31-35	58	19.0
	36-40	19	8.5
Program of Study	MPhil	215	70.3
	PhD	91	29.7

The Measurement Model

Three primary criteria were used to evaluate the measurement model: discriminant validity, reliability, and convergent validity (Hair et al., 2014). Both Cronbach's alpha (CA) and composite reliability (CR), which ought to total ≥ 0.70, were used to assess reliability. The

Fornell-Larcker criterion, indicator loadings (≥ 0.70), AVE (≥ 0.50), and cross-loadings were used to assess convergent validity. Strong relationships between indicators and their constructs were confirmed by factor loadings, which supported convergent validity see (Table 2).

Table 2: *Convergent validity (CV) Results*

Constructs	Item	FL	CA	CR	AVE
ASU	ASU1	0.829	0.726	0.838	0.722
	ASU2	0.869			
BI	BI1	0.770	0.716	0.780	0.699
	BI2	0.742			
	BI3	0.759			
	BI4	0.664			
AWR	AWR1	0.834	0.794	0.866	0.619
	AWR2	0.768			
	AWR3	0.681			
	AWR4	0.787			
	AWR5	0.734			
INF	INF1	0.738	0.752	0.843	0.574
	INF2	0.758			
	INF3	0.814			
	INF4	0.716			
PEOU	PEOU1	0.831	0.899	0.925	0.713
	PEOU2	0.864			
	PEOU3	0.854			
	PEOU4	0.859			
	PEOU5	0.811			
PU	PU1	0.883	0.844	0.896	0.686
	PU2	0.820			

	PU3	0.840			
	PU4	0.758			
TAE	TAE1	0.698	0.757	0.845	0.578
	TAE2	0.839			
	TAE3	0.779			
	TAE4	0.721			
TMR	TMR1	0.768	0.770	0.853	0.592
	TMR2	0.825			
	TMR3	0.761			
	TMR4	0.720			

A construct is considered trustworthy if its square root of AVE is higher than its Pearson correlation with other constructs, as per the Fornell-Larcker criterion. When it comes to cross-loadings, each indication ought to load more on the construct to which it is allocated. These requirements are met, as seen in (Table 3).

Table 3: Fornell-Larcker Criterion

	ASU	**BI**	**AWR**	**INF**	**PEOU**	**PUS**	**TAE**	**TMR**
ASU	**0.726**							
BI	0.018	**0.717**						
AWR	0.467	-0.020	**0.760**					
INF	0.089	0.331	0.045	**0.757**				
PEOU	0.058	0.393	-0.028	0.553	**0.844**			
PUS	0.105	0.346	0.030	0.550	0.741	**0.827**		
TAE	0.073	0.276	0.031	0.357	0.423	0.397	**0.761**	
TMR	0.052	0.391	-0.003	0.524	0.404	0.342	0.418	**0.769**

By measuring the average correlations across components, the Heterotrait-Monotrait ratio (HTMT) is an additional method to evaluate discriminant validity. It is advised to keep the

number below 0.85 (Henseler et al., 2015). HTMT evaluation is used in (Table 4) for confirming discriminant validity.

Table 4: *(HTMT) Heterotrait-Monotrait Ratio*

	ASU	**BI**	**AER**	**INF**	**PEOU**	**PUS**	**TAE**	**TMR**
ASU								
BI	1.018							
AER	0.690	0.119						
INF	0.177	0.405	0.146					
PEOU	0.176	0.466	0.085	0.670				
PU	0.182	0.404	0.107	0.687	0.848			
TAE	0.170	0.374	0.103	0.470	0.508	0.488		
TMR	0.132	0.479	0.076	0.682	0.481	0.413	0.543	

Table 5: *Hypothesis results*

Hypothesis	**Structural Path**	**Path Coefficient (PC)**	**t-value**	**p-value**	**Decision**
H-1	(TMR → INF)	0.281	12.168	0.000	Accepted
H-2	(TMR → PU)	0.123	2.331	0.002	Accepted
H-3	(TMR →PEOU)	0.211	2.758	0.003	Accepted
H-4	(INF → AER)	0.289	2.456	0.000	Accepted
H-5	(INF → PU)	0.673	3.362	0.003	Accepted
H-6	(INF → PEOU)	0.728	32.624	0.000	Accepted
H-7	(AER → PU)	0.281	2.820	0.003	Accepted
H-8	(AER → PEOU)	0.550	18.740	0.000	Accepted

H-9	(TAE → PU)	2.428	14.123	0.000	Accepted
H-10	(TAE → POEU)	0.443	20.245	0.002	Accepted
H-11	(PU→ PEOU)	0.630	41.700	0.000	Accepted
H-12	(PEOU → BI)	0.608	23.321	0.000	Accepted
H-13	(PU → BI)	0.355	6.153	0.001	Accepted
H-14	(BI→ ASU)	0.465	7.803	0.000	Accepted

In order to evaluate a structural model, Hair et al., (2014) state that model fit, R2, and effect magnitude must be evaluated. The findings, which are shown in Table 5, demonstrate that every hypothesis put forth has statistical validity. BI and ASU are impacted by PU and PEOU, which are strongly influenced by AER, INF, TMR, and TAE. PEOU is positively impacted by PU as well, and the two of them work together to influence BI and system use. Figure 2 shows the model of structural equations. For real system use, Table 6 displays a strong R2 value of 0.613. Table 7 provides information on effect sizes, and Table 8 displays the outcomes of the model fit. Overall, the results validate the model.

Table 6: *R-square*

Constructs	**R^2**
Actual system Use,	0.613
Behavior Intention,	0.716
Influencers,	0.734
Perceived Ease of Use,	0.728
Perceived Usefulness,	0.789
Training Modes,	0.757

Table 7: *Total Effect Size Results*

	ASU	**BI|**	**AER**	**INF**	**PEOU**	**PUS**	**TAE**	**TMR**
ASU								
BI	0.204	0.211		0.331	0.260	0.188		0.177

AER	0.354				
INF	0.209	0.025	0.352	0.550	0.544
PEOU	0.138	0.106			
PUS	0.316	0.346	0.641		
TAE	0.105	0.313	0.127		
TMR	0.107	0.203	0.184	0.131	

Table 8: *Model Fitness*

	Saturated model	**Estimated model**
SRMR	0.064	0.102
d_ULS	2.404	6.186
d_G	0.682	0.768
Chi-square	1222.930	1298.464
NFI	0.736	0.720

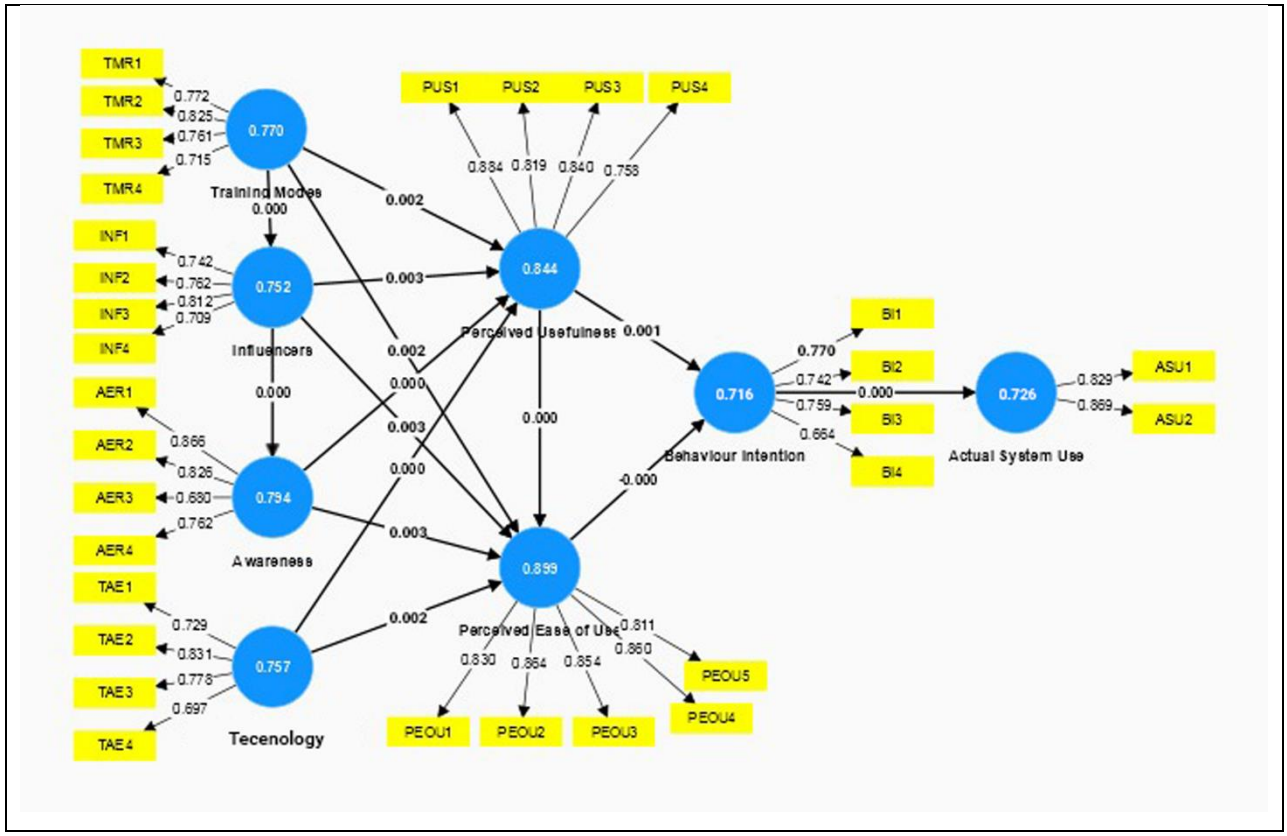

Figure 2: *Framework Assessment*

Discussion

The purpose of this research is to clarify the variables affecting postgraduate students' adoption of e-resources. In order to explain postgraduate students' acceptance of e-resources, this study expanded the TAM model by including external variables such as training methods, influencers, awareness, and technology. The adoption of e-resources by students was found to be significantly impacted by each element (Davis *et al*., 1989; Davis *et al*., 1989; Arif and Ameen, 2011 and Bakhsh *et al*., 2017). This suggests that perceived ease of use and perceived usefulness of e-resources are strongly correlated with training modes, influencers, awareness, and technology. These findings are corroborated by another study that found that students thought e-resources were helpful and simple to use when faculty members provided e-resource training sessions (Ali, 2005). The findings emphasize the crucial part influencers play in increasing the use of e-resources.

The main forces behind encouraging the use of e-resources are peers, instructors, and library staff, highlighting the crucial role that training and influencers have in fostering adoption (Okyere Kwakye and Md Nor, 2020; Ahmad, 2017). Kim (2017) claims that pupils are unable to understand how to use e-resources because of a lack of training. These findings are corroborated by another study that found students were ignorant about the availability of e-resources through the library, as well as their practicality and usability. In a similar vein, Emwanta and Nwalo (2013) discovered that the computer and digital literacy as significance key barrier influencing the adoption of e-resources. But according to Egberongbe's (2011) research, the most crucial element in increasing the uptake of e-resources is library orientation. Furthermore, perceived ease and useful are positively impacted by the lack of influencers and training sessions. In order to influence the adoption of e-resources, faculty and training act as mediators. In addition to obtaining training from teachers, users were able to identify the benefits of resources and make efficient use of them because they received support from friends, classmates, faculty, and library professionals (Kumar and Kumar 2010).

The results of our study demonstrate that awareness significantly affects perceived utility and convenience of use while using e-resources. Students who experienced e-resources may find it easier to overcome obstacles and have a more positive opinion of how simple and practical the system is to use. Similar to this, Amini et al. (2021) emphasized that in order to boost the adoption of e-resources, librarians should be proficient researchers, data analysts, efficient planners, and literacy instructors. Awareness and training have a significant relationship. Students need regular training to enhance their usage of e-resources. Additionally, a range of marketing campaigns can be used to raise awareness. If students are aware of the e-resources available within an institution, they may find it simple to obtain the information they require. However, the results of our study regarding technology and e-resource adoption demonstrate that technology positively affects the perceived utility and convenience of use of e-resources. (Ali, 2005) reports that technology tools have a positive influence on PEOU and PU of e-resources utilization. However, slow downloading, restricted internet connectivity, and unavailability of labs are the main reasons for not visit e-resources; therefore, students considered them difficult and useless (Runaas *et al.,* 2017; Lyu *et al*.., 2019).

The results of the H11–H14 study also showed a substantial correlation with perceived ease of use, PU, and PEOU, a beneficial effect on the intention of behavior to use, and a significant relationship between BI and actual system use.

It suggests that because of their practicality and ease of use, students would place a higher value on electronic resources than manual ones. Consistent with previous research, our results support the idea that students' subsequent plans to use electronic materials are highly influenced by perceived utility and usability (Davis, 1989; Borrego *et al.*, 2007; Zhou *et al.*, 2017; Rafi *et al.*, 2019; Yoon, 2016; Mustafa *et al*., 2021).

In light of the aforementioned facts, libraries at universities should provide technological IT solutions that boost the utility of electronic materials. Similarly, database developers and institutional administration ought user-friendliness and practical features into account when developing digital resources such as academic databases, learning management systems (LMS), institutional repositories, online public access catalogs (OPAC), and digital libraries. To teach research students about e-resources, the university administration and libraries should host lectures and training sessions (Abdul Rahman *et al*., 2020). This is particularly helpful for the participating institutions in the process of identifying domains that need betterment and improvement. The study's findings will then help librarians identify areas for improvement by offering training that encourages users to use e-resources more frequently.

Conclusion

By enhancing the TAM framework, the main goal of this study is to assess the impact of internal variables (awareness, training, influencers, and technology) on the adoption of e-resources. The study's findings validated all hypotheses, showing that technology, influencers, awareness, and training are significant determinants of a system's (perceived usefulness PU) and (perceived ease of use, PEOU) and that these constructs significance correlate with (behavioral intentions BI) to utilize e-resources. The present investigation examines postgraduate students' comprehension of electronic resources in Punjab, Pakistan's public universities in order to bridge the conceptual gap.

Limitations and Recommendations

The present work makes significant progress in the adoption of e-resources, but it also brings up several difficulties that should be taken into account in subsequent studies. Only three public universities in Punjab have tested the created conceptual model to ascertain postgraduate students' acceptance of e-resources; professors' approval of the same technology has not been assessed. This model may be evaluated later with large populations and samples from a variety of academic subjects and study levels to further generalize as well as enhance the results. Additionally, the scale can be tested in various institutions and nations and developed further with the participation of other specialists. Future research may also give priority to variables influencing e-resource utilization. Research can also be done to find the factors that encourage or discourage the use of electronic resources. Examining variations in e-resource behavior across various demographic categories is another possibility. The intention is to find out how well alternative technologies such as e-learning and collaborative learning are accepted. Sixth, the goal of this research has been to extend the TAM by adding other variables and components. It would be beneficial to include contextual components to the suggested model in a later investigation. Since the incorporation of internal components with TAM is seen as novel, This model supports the study's main finding of a positive relationship between TAM and external components and provides a basis for further research, particularly when it involves analyzing the function of external elements in various settings.

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