REVISING THE PARADIGM: RELATIONSHIP BETWEEN ELEARNING AND ACHIEVEMENT OF HEALTHCARE RESEARCH SCHOLARS

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ABSTRACT

The objective of the study was to investigate the relationship between elearning and the academic achievement of research scholars in healthcare's higher education institutions using multimediators. The study used a theoretical network approach for the review of the literature and the Barron & Kenny model for mediation. The study employed a quantitative deductive cross-sectional survey design. The sample size was 137 doctoral and master's level researchers in healthcare's higher education institutions. Convenient sampling was done. The study found that predictors explain significant variation in the criterion variable. The study reported that perception about elearning is a significant mediator between the use of learning and students' academic achievement, the use of eLearning between eLearning and achievement, whereas partial mediation is shown by training and coaching facilities between the use of eLearning and achievement. The study found that computer experience was insignificant for more than three variables, i.e., eLearning, Training and Coaching Facilities, Use of eLearning, and Students' Academic Achievement. Except for Perception about eLearning, the rest of the demographics have a significant role. The study recommends following the principles of end-user computing, usefulness, and ease of use in developing elearning systems. Moreover, developers should not play down the orgware and peopleware to give technology a human face to avoid disturbances, resistance, and failures.

Keywords: *elearning, perceptions about elearning, training and coaching facilities, use of elearning, students' academic achievement*

INTRODUCTION

From 2019 to 2022 the covid-19 pandemic shook the world (Kundi, 2022). It also affected the education system around the globe. Educational institutions remained closed. Yet, information and communications technologies (ICTs) appeared as blessings and a shift from conventional classroom models to online modes of learning and teaching has been witnessed. The existing research reports over and over again that education is the top user of software applications and web services (Kundi & Alharbi, 2022; Nawaz & Kundi, 2010a, 2011; Kundi et al., 2017) thereby creating a diversity of users, i.e., teachers, students, the knowledge-industry, academia, and institutions that are providing advanced ICT-based education (Abdullah et al, 2016). eLearning provides lively information facilities for both learners and educators (Manochehr, 2006). Recent reorientations of knowledge acquisition and economic globalization have forced nations to transform their education systems from conventional into digital platforms to produce

computer literate workforce compatible with market demands (Nawaz& Kundi, 2011; Rhema & Miliszewska, 2014). The healthcare sector in higher education is anticipated to play a revolutionary role in the information age by producing knowledge and skills compatible with the existing global-knowledge-economy (Cheng et al., 2017). This role is supported by the fact that the education sector is considered the leading user of software applications (Oye et al., 2012). The existence of digital gadgets in higher education ever since the technology was introduced shows an evolution in the design and application of educational technologies (Alvarez et al., 2013). The rapid and unparalleled innovations in chip technology during the past few years have contributed to several transformational models of elearning and its uses (Al-Fraihat et al., 2011), especially during the Covid-19 pandemic.

The repeated claim of the supporters of technology is that information and communication technologies provide exceptional opportunities, in particular, for developing countries (Arkorful & Abaidoo, 2015). This optimism is based on two things. First, it is the phenomenal potential of digital tools that have turned the world into a global village with its unique feature of connectivity that has never before been seen in the *history* of human civilization (Rhema & Miliszewska, 2014). Second, developing and developed countries have long been suffering from isolation, a lack of empowerment, and different types of digital apartheid (Setyohadi et al., 2017). ICTs have the ability to overcome all of those divisions and connect the world into a global society (Parkes et al., 2015). The introduction of second-generation products like wikis, blogs, and social bookmarking has evolved from the amalgamation of Web 1.0 into Web 2.0 and reshaped one-way communication into two-way communication (Jawad & Shalash, 2020). The movement of the Free and Open-Source System caused the digital transformation in the educational sector in developing countries. To attain an education for all and to encourage lifelong learning, ICTs for development should include in higher education's mission that all ICT tools and resources be posted on the internet for the use of the public at large for the benefits of world libraries and academic publications (Kundi & Alharbi, 2022; Kundi et al., 2017).

With the accessibility of educational technologies around the globe, researchers have found that instructional technologies are used in higher education institutions and offer unprecedented profit for them in resolving their prolonged education issues (Cidral et al., 2018; Kundi, 2022). For example, elearning facilities have proven to be beneficial in developing countries where reaching the population is hard when it comes to providing physical education facilities on a large scale (Kundi, Nawaz, & Khan, 2010). Likewise, elearning technology is serving higher education institutions well to lessen their isolation and connect them to the internet-based world community and help users gain knowledge, entertainment, and aid them in politics and business (Rhema & Miliszewska, 2014). The fact cannot be ignored that educational technologies do not automatically become beneficial just because they are purchased and owned by millions of users and organizations because there is a need for them to be categorized according to the diverse requirements of their users (Kundi & Alharbi, 2022; Nawaz & Kundi, 2011).

There is a lengthy list of such devices and technologies that cannot be generalized for every institution. Instead, there is a need for each institution to make intelligent choices of the appropriate software, hardware, and networking facilities (Jawad & Shalash, 2020; Kundi, Albejaidi & Akhtar, 2017). The "leading-edge syndrome" is the gravest problem faced by the world when it comes to the preference for technology in elearning projects (Cidral et al., 2018). Even though researchers stress that already established technologies should be opted for rather than the latest ones, most institutions prefer the leading-edge technologies that are not only ultramodern and complex to use but also incur great expense (Kundi & Alharbi, 2022; Kundi et al., 2017; Nawaz, 2011; Nawaz & Kundi, 2010a, 2011). Research on this issue reveals that when institutions opt for the latest, untested technologies instead of established technologies there is a chance that they will be stuck with a "white elephant" that is difficult to adopt and effectively integrate with their already existing system (Kundi & Alharbi, 2022; Kundi et al., 2017; Nawaz & Kundi, 2010a, 2011). However, this is a bigger problem for developing countries than developed states (Oye et al., 2012). The benefits of elearning as an enabler technology for teachers and students in higher education has been studied; however, how this new technology contributes to students' academic achievement is

a critical question that must be answered to assess the real contribution of elearning (Abbasi et al., 2020; Kundi & Alharbi, 2022).

PURPOSE OF THE STUDY

This study explores the concepts of elearning and its learning issues for research scholars, investigates the direct and indirect impacts of elearning on student's achievement, identifies the relationships between the different factors of elearning and the achievement scores of students, and examines the relationships between student demographics and the research variables of eLearning and Student Academic Achievement. Thus, the empirical results of this study offer hands-on implications to augment effective elearning environments by research scholars, educators, and administrators.

LITERATURE REVIEW

Perceptions about eLearning

The belief of students about the role of ICTs determines the level of a student's interest in using elearning (Nawaz & Kundi, 2011). Research shows that some students consider ICTs to be a solution for all learning ills but others see them as normal like other technologies (Kundi & Alharbi, 2022; Pham et al., 2019; Kundi et al., 2017; Nawaz & Kundi, 2010a, 2011). The students of healthcare in higher education institutions are considered to be digital citizens, and they accept elearning platforms at their higher education institutions to enhance their understanding and academic performance (Greenhow & Galvin, 2020). However, existing research on students' perceptions of elearning exhibit a lack of consistency in the results concerning the prediction of their academic achievement (Kundi & Alharbi, 2022; Woods et al., 2004). The current study aimed to investigate the perception of students of elearning in higher education institutions based on students' experiences, academic engagement, and digital use of elearning platforms for their academic achievement (Henrie et al., 2015). It is reported that students positively perceive elearning experiences in higher education institutions; yet, they need to have powerful digital skills to do academic work, make committed efforts, and participate in elearning environments (Jaggars & Xu, 2016).

eLearning

eLearning globally took with a leading role because it has excellent solution models for higher education institutions operating in an environment of uncertainty and rapid transformation (Al-Fraihat et al., 2020; Nawaz & Kundi, 2011). Considering the perception of students about elearning and their expertise are important for successfully developing the academic programs, as the attitude of the end user towards the application of elearning is one of the critical factors (Kundi et al., 2010). Electronic learning, or elearning, is the application of internet and computer technologies to create and deliver a learning environment with a range of instructions, information resources, and solutions (Kundi et al., 2017; Mtebe & Raphael, 2018). Its basic aim is to increase individual and organizational performance (Cheng et al., 2017; Chinedu-Eze et al., 2018). eLearning is the use of computers and telecommunication technologies in teaching for academic tasks and assignments, among other things. This technology is useful because it is one of the best tools to increase student success and reduce failure. Several studies have been conducted to investigate different education delivery systems and methods and found elearning to be an innovative instructional delivery system and method (Kundi & Alharbi, 2022; Allah Nawaz & Kundi, 2011). Kim et al. (2019) considered it to be as effective as the conventional and traditional classroom. eLearning plays an instrumental role in conventional classroom learning, where learners anticipate the use of technology to gain experience with new technology through an enhanced and accessible learning (Kundi & Nawaz, 2010b; Zolochevskaya et al., 2021). However, to meet the students' expectations when they have varying backgrounds, decision-makers in higher education institutions must first understand the needs of their students. Kim et al. (2019) reported that many students still prefer blended learning. Lyons & Evans (2013) considered student satisfaction to be imperative for the successful execution of this new learning system. Therefore, the emphasis should not just be on elearning technology but also on the use of technology to create customized, personalized, and interactive learning.

Training and Coaching Facilities

The students learn computer applications either through formal courses and diplomas or informally through family members, friends, and self-learning (Jawad & Shalash, 2020). The provision of

facilities by higher education institutions contributes to the speed of students' digital comfort in their learning process (Chinedu-Eze et al., 2018) and the availability of training and coaching facilities to learn computers for educational purposes. Having well-equipped computer labs and training by professionals changes the role of elearning in the learning process. Research shows that developing coaching expertise increases employees' skills and competencies and has a long-lasting systemic impact on talent retention and the institution's budget (Kundi & Alharbi, 2022; Kundi et al., 2017; Nawaz & Kundi, 2010a, 2011). To date, the challenge for higher education institutions has been how to spread fundamental coaching skills beyond leaders and managers who typically attend in-person workshops. The result is that performance consultants have created **elearning training and coaching** so that organizations can expand access to learning and provide cost-effective training throughout their institution (Greenhow & Galvin, 2020).

Use of eLearning

The term elearning implies the use of computers by teachers and students in the teaching and learning process (Islam, 2013). Since social networks are widely used by teachers as well the students (McNaught & Kennedy, 2005), many researchers have explored and investigated the relationship between social media to the academic performance of students in higher education institutions (Cheng et al., 2017; Deng & Tavares, 2013). Particularly, Kirschner & Karpinski (2010) studied the use of Facebook and its association with the students' academic achievement through self-reported grade point average measurement and the hours students spent studying in a week. They reported that users of Facebook had lower GPAs and they spend fewer hours per week studying as compared to the nonusers. Likewise, Junco (2012) conducted a study with a large sample (1,839 students) to investigate the association between several measures of the incidence of Facebook use, including Facebook events and time used or preparing for the class, with a 4.0 GPA. The results showed that time spent by the students on Facebook is significantly, but negatively, correlated with the overall GPA of the students. Yet, surprisingly, its use to collect and share data was found to have a positive relationship with student outcomes, but they reported a negative relationship between Facebook when used for socialization.

STUDENT ACADEMIC ACHIEVEMENT

The impacts of elearning and students' digital skills on their academic performance among healthcare scholars, comparing their achievement scores and relating these with their digital knowledge and skills, have not been explored in developing countries like Pakistan. The research student's academic achievement is generally measured with a GPA score as an outcome in higher education institutions (Leong et al., 2017). According to Nawaz and Kundi (2010a), the GPA is used to understand the role and impact of instructional methods since it is considered the ideal and real predictor of the research students' academic achievement, and it is decided based on the previously attained knowledge, skills, abilities, and several other elements, such as time and resources dedicated for academic learning (Kiviniemi, 2014; Uzelac et al., 2018). Likewise, it has been reported that the academic achievement of research students is significantly and positively related to the instructional methods and technologies they have (Carini et al., 2006). Similarly, Hodge et al. (2018) found that the deeper the engagement of the students, the better the results in the sense of all-inclusive learning.

The academic achievement of research students in healthcare's higher education institutions is significantly predicted by their elearning perceptions as well as their experiences (Rakic et al., 2020). The students who use the elearning mode have improved in their learning and achievement (Chou & Liu, 2005). Goh et al. (2017) investigated the use of elearning resources for academic purposes concerning the lack of student access to and use of elearning systems. Castillo-Merino & Serradell-Lopez (2014) and Kiviniemi (2014) however, argued that blended learning approaches that make use of both in-person and elearning are the best for improved course components and student achievement (Hidalgo-Camacho et al., 2021).

THEORETICAL FRAMEWORK ON THE RELATIONSHIP BETWEEN PREDICTORS, MEDIATORS, AND CRITERION VARIABLES

In this decade, numerous studies have been conducted that explored the perception of students and their expectations of elearning in higher education institutions, such as Cheng et al. (2017),

Nawaz & Kundi (2011), and Waits & Lewis (2003). Likewise, research findings highlight that students' perceptions of elearning in higher education institutions are induced by several factors (Tanveer & Hassan, 2020). Keller & Cernerud (2002) found that age, gender, experience, experience with computers, technology acceptance, and individual learning styles were significant predictors based on various theories of technology acceptance, for example the diffusion of innovations theory (Rogers, 2003). The Technology Acceptance Model (Davis et al., 1989) emphasized perceived ease of use and perceived usefulness. The model of this study considered users' perceptions about elearning, training and coaching facilities, use of elearning as direct and indirect predictors, and student's academic achievement as variables (Chu & Chen, 2016). The theoretical framework of this study illustrates the creation of interrelationships among the working concepts extracted from the literature. Experts have noted that unless the research variables are connected, the list of them makes no sense (Popovici & Mironov, 2015). The connections are created according to the principles as prescribed in practice and experience and recorded in the existing body of knowledge (Olelewe & Agomuo, 2016). Figure 1 is the schematic diagram of the conceptual model used as a guideline in this study.

The left side of the model indicates the direct effect while the right side shows the indirect effect.

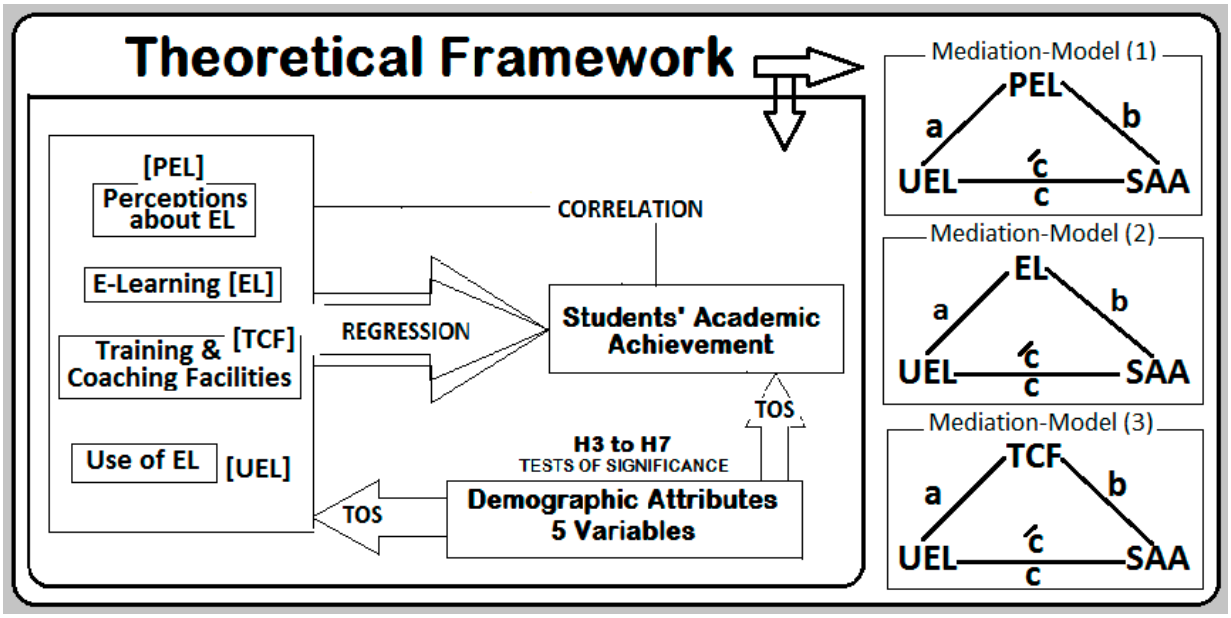
The studies report that the uses of elearning for academic achievement are significantly dependent on the perception of students about the use of elearning technologies in higher education institutions. It is well documented that the perception of the students mediates the relationship between the use of elearning and students' academic achievement (Nawaz & Kundi, 2010b). Research has also found that the relationship between the use of elearning and students' academic achievement is also mediated by elearning (Kim et al., 2019; Kundi & Alharbi, 2022; Kundi et al., 2017; Nawaz & Kundi, 2010a, 2011). Previous studies have brought to the fore the significance of training and coaching facilities as being imperative for success. Abuhassna et al. (2020) and Kundi & Nawaz (2014) reported that training and facilities mediate the relationship between the use of elearning and students' academic achievement. Based on the above-discussed relationship between predictors, mediators, and criterion variables, and the schematic diagram of the theoretical framework in Figure 1, the following hypotheses were proposed:

H_1: Predictors and criterion variables are significantly associated.

H_2: Predictors explain the variation in criterion-variable.

H_3: Perception about eLearning as a mediator in the Use of eLearning and Student

Figure 1. Schematic Diagram of the Theoretical Framework



Academic Achievement relationship.

H_4: eLearning is a mediator in the Use of eLearning and Student Academic Achievement relationship.

H_5: Training and Coaching Facilities as a mediator in the Use of eLearning and Student Academic Achievement relationship.

H_6: Private-sector sample is scoring higher than the other group.

H_7: Locals are scoring higher than nonlocals.

H_8: Males are scoring higher than females.

H_9: Respondents with Greater Experience (> = 5) are scoring higher.

METHOD

This study used a quantitative deductive cross-sectional survey design as suggested by Creswell & Creswell (2017). The sample size was determined using a standard formula for computing sample size found under Finite Population. The population of the study was doctoral and master's level researchers of healthcare in higher education institutions. The data for the formula were taken from the pilot study to test the variables and questions and to obtain statistics for the formula to compute the required sample size for the main study. Table 1 gives the detail of the formula and measurements for the sample size (n = 137).

Table 1: Pilot-Study Data Used for Sample Size Determination

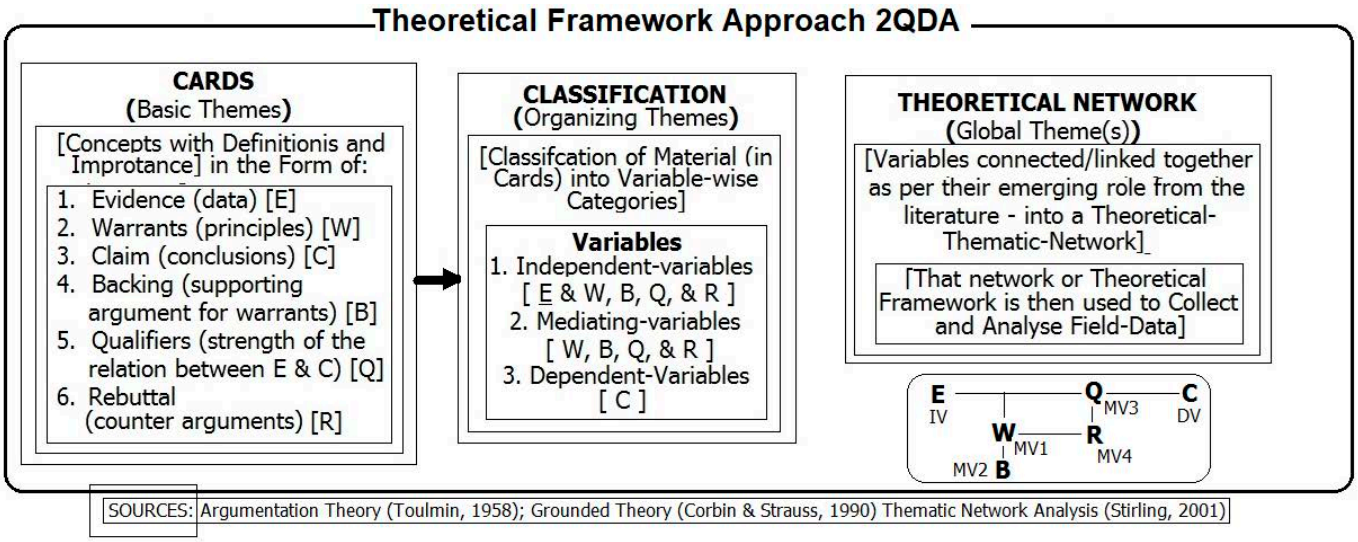
z-value for 95% Confidence Level	SD	SE	N	n
1.96	0.061	0.0085	450	137.1

DATA COLLECTION & ANALYSIS TOOLS

Theoretical Network Approach

This approach applies theory to conceptualize the topic and serves as a guideline to point out and collect relevant data and to organize and interpret the findings systematically and effectively. According to Goode & Hatt (1952), Babbie (1993), and Sekaran (1999), a theory is a well-established and documented phenomenon to perform all the steps in a social research process. Toulmin (1958) capitalized on the concept of Argumentation and Glasser and Strauss's (1967) Grounded-theory. Jennifer Stirling (2001) used an approach named TNA that starts with the preparation of research cards, which are then grouped into research constructs. Finally, data are given in the order in line with the principles of theory employing the argumentation (see figure 2). Grounded-theory by Glasser (2001) and Framework-Analysis by Ritchie & Spencer (1994) are also useful for developing a TNA for studies like this one. However, it should be noted that this approach is fundamentally based on Toulmin's (1958) Argumentation-theory, which

Figure 2. Theoretical Network Approach to Qualitative Data Analysis



is a structured way to analyze and understand the argument process.

Arguments are developed from the data using a claim, where a claim is defined as the conclusion for the argument that has established merits. Yet, it is not essential that claims must follow a logical pattern from the given set of data in hand, so this demands supportive arguments for the claims. Based on this, an argument can be separated from the data by presenting it intelligibly to ease the decision-making process for solving any problems and issues.

SURVEY

In a survey, a researcher selects a sample of respondents and then administers a standardized questionnaire to them (Babbie, 2021). Field surveys are very popular in the research on students' satisfaction all over the world. We administered a structured questionnaire to the sample (n = 137) selected from the population of research scholars from MPH Program Gomal University, Khyber Medical University, and Gandhara Medical University in Khyber Pakhtunkhwa Pakistan.

MEDIATION-ANALYSIS

According to Baron & Kenny (1986), a mediator is a variable that carries a certain influence of a predictor for the criterion variable. Mediation happens when a predicting variable significantly influences the mediator, and the predictor also significantly affects the criterion in the nonappearance of the mediator, thus, a mediator exerts a significant indirect effect on the criterion variable. Lastly, the effect of the predictors on the criterion variable becomes defunct by adding mediators in the regression-model. Baron & Kenny (1986), Kenny et al., (1998), and Hayes (2013) recommended the use of these criteria to judge mediating effects.

The review of literature also indicated that gender, hands-on experience in the use of information and communication technology, location, and organization/ sector/ department were significant demographic factors for use of elearning platforms for the teaching and learning process in higher education institutions.

RESULTS AND FINDINGS

As seen in Table 2 and Figure 4, Student Academic Achievement was recorded with a mean value of 4.752, which is the highest mean value among the variables, followed by Perception about eLearning with a mean score of 4.312, Training and Coaching Facilities, eLearning, and Use of eLearning with their respective mean scores of 4.018, 3.945, and 3.435. This shows that Student Academic Achievement was the most dominant variable.

Figure 3. Baron and Kenny (1986) Mediation-Model

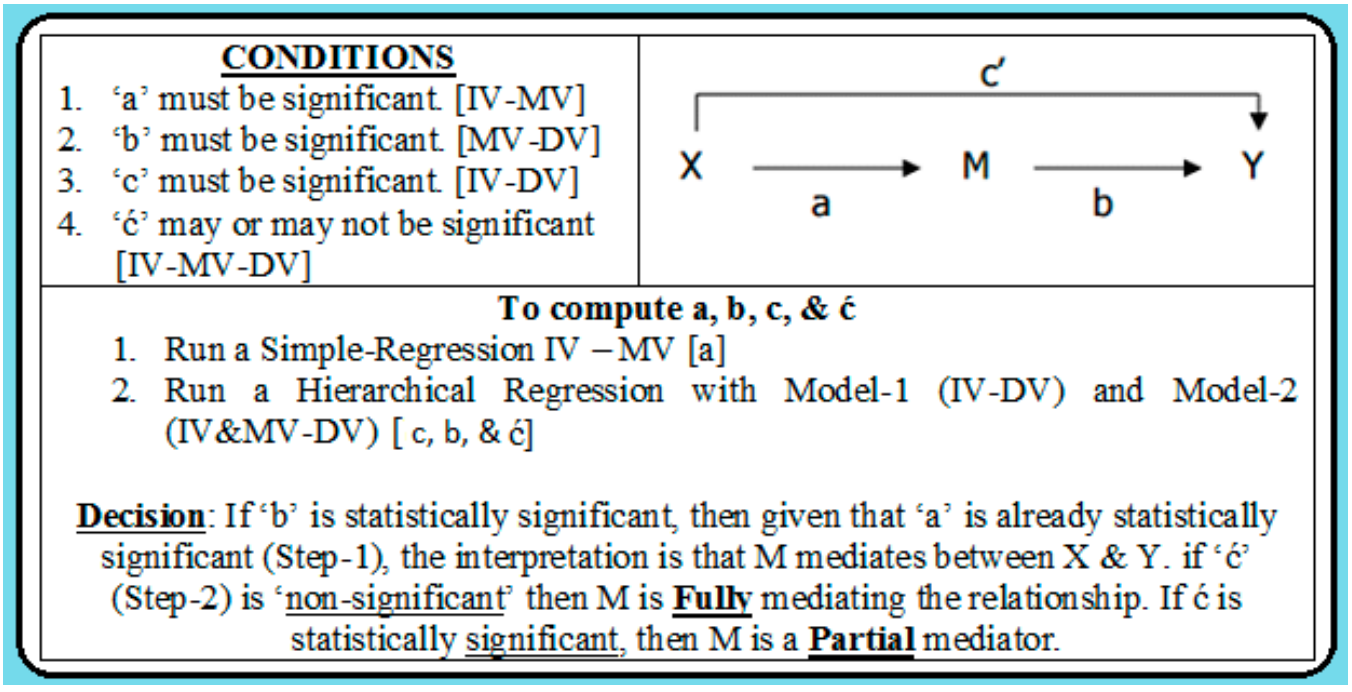
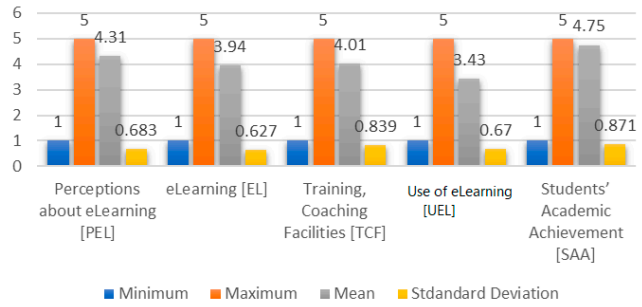


Table 2: Descriptive Statistics (n=137)

	Variables	Min	Max	Mean	SD
1	Perception about eLearning	1	5.00	4.31	.683
2	eLearning	1	5.00	3.94	.627
3	Training and Coaching Facilities	1	5.00	4.01	.839
4	Use of eLearning	1	5.00	3.43	.670
5	Student Academic Achievement	1	5.00	4.75	.871

Figure 4. Descriptive Statistics



CORRELATION ANALYSIS

Hypothesis # 1: Predictors and criterion variables are significantly associated.

Table 3: Correlations Results

1	PEL		PEL	EL	TCF	UEL	SAA
2	EL	r	.690**	1			
3	TCF	r	.737**	.819**	1		
4	UEL	r	.731**	.671**	.715**	1	
5	SAA	r	.696**	.645**	.637**	.741**	.259**

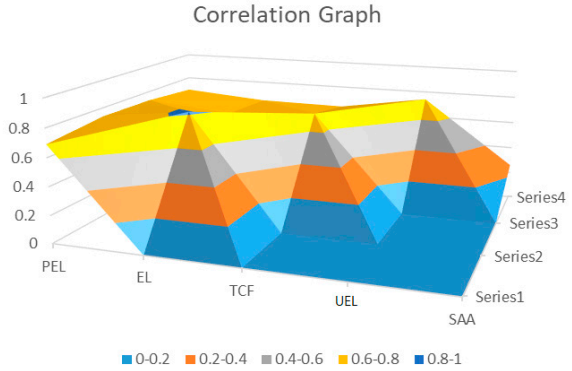
**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

n=137

Key: Perception about eLearning (PEL), eLearning (EL), Training and Coaching Facilities (TCF), Use of eLearning (UEL), and Student Academic Achievement (SAA)

Figure 5. Correlation Graph



The results shown in Table 3 and Figure 5 illustrate that the relationship between Perception about eLearning and Student Academic Achievement was moderate at r .696, $p < 0.05$. Likewise, the r value for eLearning was .645, Training and Coaching Facilities was r .637, and Use of eLearning was r .741 at $p < 0.05$ level of significance. With the increase or decrease in the Perception about eLearning, eLearning, Training and Coaching Facilities, and Use of eLearning, Student Academic Achievement also changed accordingly. This implies that Perception about eLearning, eLearning, Training and Coaching Facilities, and Use of eLearning enhance Student Academic Achievement. Thus we accepted our proposed Hypothesis 1, that predictors are significantly associated with criterion-variable.

CAUSE & EFFECT RELATIONSHIPS

Hypothesis # 2: Predictors Explain the Variation in Criterion-variable

Table 4. Summary of Model

Model	R	R^2	Adjusted R^2	SE of Estimate	F	Sig.
1	.741a	.549	.545	.436	161.70	.001a
2	.775b	.600	.594	.412	99.02	.003b
3	.784c	.615	.606	.406	69.63	.000c

a. Predictors: (Constant), UEL

b. Predictors: (Constant), UEL, PEL

c. Predictors: (Constant), UEL, PEL, EL

d. Dependent Variable: SAA

Table 5. Coefficients Results

Models	B	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		SE	Beta			
1	(Constant)	-.853	.290		-2.94	.004
	UEL	.731	.057	.741	12.71	.001
2	(Constant)	-1.195	.286		-4.17	.000
	UEL	.491	.080	.498	6.17	.001
	PEL	.351	.085	.332	4.11	.000
3	(Constant)	-1.591	.334		-4.76	.010
	UEL	.429	.083	.435	5.15	.000
	PEL	.271	.091	.256	2.96	.004
	EL	.225	.101	.177	2.22	.028

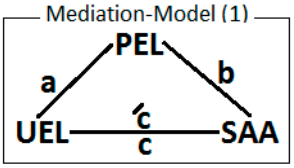
The results for the direct impact of the predictors on criterion variables are presented in Tables 4 and 5, showing R^2 of .549 for model 1, .600 for model 2, and .615 for model 3. It could be inferred from the results that R^2 .615 shows a collective effect on Student Academic Achievement, which indicates 61.5% of the variance in the criterion variable. The value of the Training and Coaching Facilities on the other hand was insignificant and, therefore, was excluded. The Beta value .435, .256, and .177 in table 6a explain that a 1% change in Perception about eLearning, eLearning, and Use of eLearning bring a 43.5%, 25.6%, and 17.7% rise in Student Academic Achievement. Thus, based on our results, we accepted our proposed Hypothesis 2, that predictors explain variation in the criterion variable.

MEDIATION-ANALYSIS

A. PEL As Mediator

Hypothesis # 3: PEL as Mediator in UEL-SAA Relationship

Figure 6. Model 1. Mediation

Use of eLearning was claimed to be the main determinant of Student Academic Achievement while Perception about eLearning was used as a mediator. The question was does Use of eLearning or Perception about eLearning play a greater significant role in bringing change in the Studengt Academic Achievement?	

i. Computing 'a'

Table 6. Summary of Model

Model	R	R^2	Adjusted R^2	SE of Estimate	F	Sig.
1	.731a	.534	.531	.419	152.52	.001a

a. Predictors: (Constant), UEL

b. Dependent Variable: PEL

Table 6a. Coefficients Results

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		SE	Beta			
1	(Constant)	.975	.279		3.50	.001
	UEL	.682	.055	.731	12.35	.000

ii. Computing 'b,' 'c,' and 'ć'

Table 6b. Summary of Model

Model	R	R2	Adjusted R^2	SE Estimate	R^2 Change	F	Sig.
1	.741a	.549	.545	.436	.549	161.70	.000a
2	.775b	.600	.594	.412	.051	99.02	.020b

a. Predictors: (Constant), UEL

b. Predictors: (Constant), UEL, PEL

c. Dependent Variable: SAA

Table 6c. Coefficients Results

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		SE	Beta			
1	(Constant)	-.853	.290		-2.94	.004
	UEL	.731	.057	.741	12.71	.000
2	(Constant)	-1.195	.286		-4.17	.010
	UEL	.491	.080	.498	6.17	.001
	PEL	.351	.085	.332	4.11	.000

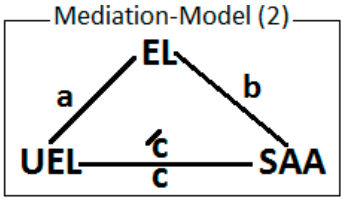
Table 6d. Assessment

	Criteria	Y/N	
1	'a' requires to be significant. [IV-MV]	Y	'a' B=0.682 p=0.000
2	'b' requires to be significant. [MV-DV]	Y	'b' B=0.351 p=0.000
3	'c' requires to be significant. [IV-DV]	Y	'c' B=0.731 p=0.000
4	'ć' might or might not be significant [IV-MV-DV]	Y	'ć' B=0.491 p=0.000
In stepwise multiple regressions (IV-DV & IV& MV-DV), R2 rose from 50% to 60% (0.549 to 0.600) due to the mediator. Likewise, the weight of Beta for 'c' decreased from .731 to .491 (P=0.000) while the Beta-weight of mediator 'b' is .351 (P=0.000). Since 'ć' is not insignificant, partial mediation was confirmed, so Hypothesis 3 was supported and accepted.			

B. EL as Mediator

Hypothesis # 4: EL as Mediator between the UEL-SAA Relationship

Figure 6. Model 2. Mediation

Use of eLearning was considered the main determinant of Student Academic Achievement while eLearning was used as a mediator. The question was does Use of eLearning or eLearning play any significant role in bringing difference in Student Academic Achievement?'	

i. Computing 'a'

Table 7. Summary of Model

Model	R	R^2	Adjusted R^2	SE of the Estimate	F	Sig.
1	.671a	.450	.446	.37945	108.78	.000a

a. Predictors: (Constant), UEL

b. Dependent Variable: EL

Table 7a. Coefficients Results

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		SE	Beta			
1	(Constant)	2.112	.252		8.37	.000
	UEL	.521	.050	.671	10.43	.000

ii. Computing 'b," "c," and "ć"

Table 7b. Summary of Model

Model	R	R^2	Adjusted R^2	SE of Estimate	R^2 Change	F	Sig.
1	.741a	.549	.545	.436	.549	161.70	.000a
2	.767b	.589	.583	.418	.040	94.50	.002b

a. Predictors: (Constant), UEL

b. Predictors: (Constant), UEL, EL

c. Dependent Variable: SAA

Table 7c. Coefficients Results

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		SE	Beta			
1	(Constant)	-.853	.290		-2.94	.004
	UEL	.731	.057	.741	12.71	.010
2	(Constant)	-1.577	.343		-4.59	.000
	UEL	.552	.074	.560	7.43	.002
	EL	.343	.096	.270	3.58	.010

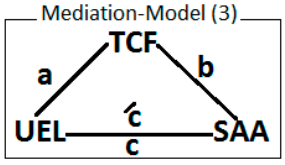
Table 7d. Assessment

	Criteria	Y/N	
1	'a' requires to be significant. [IV-MV]	Y	'a' B=0.521 p=0.010
2	'b' requires to be significant. [MV-DV]	Y	'b' B=0.343 p=0.000
3	'c' requires to be significant. [IV-DV]	Y	'c' B=0.731 p=0.000
4	'ć' might or might not be significant [IV-MV-DV]	Y	'ć' B=0.552 p=0.014
In stepwise multiple regressions (IV-DV & IV& MV-DV), R2 increased from 55% to 59% (0.545 to 0.589) because of the mediator. Likewise, the weight of Beta for 'c' decreased from .731 to .552 (p-value=0.000). The Beta weight of mediator 'b' was .343. As 'ć' was not insignificant, evidence of partiality was confirmed. Therefore, Hypothesis 4 was accepted.			

C. TCF AS Mediator

Hypothesis # 5: TCF as Mediator between the UEL and SAA Relationship

Figure 7. Model 3. Mediation

Use of eLearning was claimed as the major determinant of Student Academic Achievement while Training and Coaching Facilities were used as a mediator. The question was does Use of eLearning or Training and Coaching Facilities play a major and significant role in bringing change in Student Academic Achievement?'	

i. Computing 'a'

Table 8. Summary of Model

Model	R	R^2	Adjusted R^2	SE of Estimate	F	Sig.
1	.715a	.511	.508	.4286	139.21	.000a

a. Predictors: (Constant), UEL

b. Dependent Variable: TCF

Table 8a. Coefficients Results

Model B		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		SE	Beta			
1	(Constant)	1.331	.285		4.67	.002
	UEL	.666	.056	.715	11.79	.000

ii. Computing 'b,' 'c,' and 'ć'

Table 8b. Summary of Model

Model	R	R2	Adjusted R2	SE	R2 Change	F	Sig.
1	.741a	.549	.545	.4363	.549	161.70	.000a
2	.756b	.572	.566	.4265	.023	88.24	.000b

a. Predictors: (Constant), UEL

b. Predictors: (Constant), UEL, TCF

c. Dependent Variable: SAA

Table 8c. Coefficients Results

Model B		*Unstandardized Coefficients*		*Standardized Coefficients*	*t*	*Sig.*
		SE	*Beta*			
1	*(Constant)*	*-.853*	*.290*		*-2.94*	*.004*
	UEL	*.731*	*.057*	*.741*	*12.71*	*.000*
2	*(Constant)*	*-1.161*	*.306*		*-3.79*	*.002*
	UEL	*.576*	*.080*	*.584*	*7.17*	*.000*
	TCF	*.232*	*.086*	*.219*	*2.68*	*.008*

Table 8d. Assessment

	Criteria	Y/N	
1	'a' requires to be significant. [IV-MV]	Y	'a' B=0.666 p=0.010
2	'b' requires to be significant. [MV-DV]	Y	'b' B=0.232 p=0.000
3	'c' requires to be significant. [IV-DV]	Y	'c' B=0.731 p=0.000
4	'ć' might or might not be significant [IV-MV-DV]	Y	'ć' B=0.576 p=0.008
In the stepwise multiple regressions (IV-DV & IV& MV-DV), R2 increased from 55% to 57% (0.545 to 0.589) because of the mediator. Likewise, the weight of Beta for 'c' decreased from .731 to .576 (p-value=0.000). The Beta-weight of mediator 'b' was .232. As 'ć' did not appear insignificant, partial mediation exists, and Hypothesis 5 was supported.			

Testing Group Mean Differences for Sector (Public/Private), Domicile (Local/ Nonlocal), Gender (Male/Female), and Computer Experience (Computer Literate/ Noncomputer Literate)

Table 9. Results for Demographic Differences

Variables	*Perception about eLearning*			*eLearning*			*Training and Coaching Facilities*			*Use of eLearning*			*Student Academic Achievement*		
Sector	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*
	23.07	*5.73*	*.000*	*8.63*	*5.18*	*0.04*	*42.7*	*4.46*	*.000*	*9.00*	*5.50*	*0.03*	*7.66*	*8.26*	*0.06*
Domicile	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*
	13.46	*5.90*	*.000*	*8.67*	*6.30*	*.004*	*35.42*	*6.15*	*.000*	*5.86*	*6.39*	*.017*	*3.15*	*8.62*	*.078*
Gender F t p				*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*
	3.20	*3.34*	*.076*	*.282*	*3.53*	*.596*	*4.20*	*3.89*	*.042*	*1.39*	*2.68*	*.240*	*.011*	*3.49*	*.918*
Computer Experience	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*	*F*	*t*	*p*
	4.16	*3.55*	*.043*	*.004*	*3.03*	*.947*	*2.66*	*4.24*	*.105*	*.239*	*2.07*	*.626*	*.011*	*2.16*	*.917*

To check the significant mean difference among the four groups, a *t*-test was performed. The demographic differences are presented in Table 9. It could be seen that F-statistics was 23.05, and the *t*-value was 5.73 for Perception about eLearning, F .863, t 5.18 for eLearning, F 4.47, t 4.46 for Training and Coaching Facilities, F 9.00, t 5.50 for Use of eLearning, and F 7.66, t 8.26 for Student Academic Achievement are all significant for H_6 at *p* 0.05, therefore; we accepted Hypothesis 6,that private-sector sample is scoring higher than the other group. The seventh hypothesis was that locals are scoring lower than nonlocals [H_7]. It could be observed from Table 9 that F-statistics 13.46 and *t*-value 5.90 for Perception about eLearning, F.8.67, t 6.30 for eLearning, F 35.42, t 615 for Training and Coaching Facilities, F 5.86, t 6.39 for Use of eLearning, and F 3.15, t 8.62 for Student Academic Achievement were also significant at p 0.05 for H_7. Thus, we accept the Hypothesis 7. As far as gender is concerned, the results also indicated its importance as a demographic predictor, although the results showed that F 3.20 with t vale 3.34 is insignificant at p 0.05, and F .011 with t value 3.49 at p-value .98 for Perception about eLearning and Student Academic Achievement respectively. However, for rest of the three variables, F value and t value for eLearning was .283 and 3.53 as well as for Training and Coaching Facilities, (F value was 4.20 with t value 3.85), and F for Use of eLearning was 1.39, t value 2.86 with p-value < 0.05. Therefore, we partially accepted Hypothesis 8, that males score higher than females. Similar results were found for computer experience and Perception about eLearning, eLearning, Training and Coaching Facilities, Use of eLearning, and Student Academic Achievement, yet it was insignificant for more than three variables, eLearning, Training and Coaching Facilities, Use of eLearning, and Student Academic Achievement, and remained significant for only one factor, Perception about eLearning. Therefore, Hypothesis 9 was not substantiated, and we concluded that respondents with greater experience (> = 5) do not score higher.

DISCUSSION AND CONCLUSION

Healthcare's higher education institutions in developing countries are undergoing rapid environmental changes that demand they educate more graduates, especially in the field of research with varied backgrounds, and different age groups of students with diverse requirements (Jawad & Shalash, 2020). eLearning is considered critical for streamlining their operations and therefore, irrespective of the background differences, all higher education institutions need to invest funds into developing new systems and services, e.g., a new and modern IT infrastructure, web-based online management systems, and academic management system (Nawaz & Kundi, 2010a). Higher education institutions are working to fully integrate these technologies with their learning management systems, digital libraries, and financial and administrative systems while investing in their employee development through digital training (Zolochevskaya et al., 2021). Hidalgo-Camacho et al. (2021) underscored the complexities and issues posed by the innovations for academics as well as the students. Today students are the digital natives who are prone to use these digital gadgets as an integral part of life.

Considering the significance of the results of the previous studies, it is important to take a critical view of our results in light of the previous findings and see how they agree or disagree with the findings of the previous research. Several studies have reported that the number of educational websites and learning management systems is growing with unprecedented speed (Abuhassna et al., 2020; Kundi & Alharbi, 2022; Kundi et al., 2017; Nawaz & Kundi, 2010a, 2011). The Covid-19 crisis tripled the effect since higher education institutions were physically shut for classes and there was a mushroom growth in and switchover to elearning platforms. Since March 2020, most communications are now done online.

With this perspective, our study finds a significant but moderate relationship between Perception about eLearning and Student Academic Achievement, while eLearning was significantly related to Training and Coaching Facilities and Use of eLearning, which implies an increase or decrease in the Perception about eLearning, eLearning, Training and Coaching Facilities, and Use of eLearning with Student Academic Achievement also bringing changes. This indicates that Perception about eLearning, eLearning, Training and Coaching Facilities, and Use of eLearning enhance Student Academic Achievement.

Likewise, predictors are reported to have

significant direct effects on the criterion variable, i.e., R^2 .549 for model 1, .600 for model 2, and .615 for model 3. It could be concluded from the above results that R^2 .615 shows a collective effect on Student Academic Achievement, indicating 61.5% of the variance in the criterion. However, Training and Coaching Facilities was found to be insignificant. Partial mediation was found for the Perception of eLearning as a mediator in the relationship between Use of eLearning and Student Academic Achievement, while partial mediation is recorded for eLearning as a mediator in the relationship between Use of eLearning and Student Academic Achievement. Training and Coaching Facilities as a mediator in Use of eLearning and Student Academic Achievement also mediate partially. Our study found that Perception about eLearning, eLearning, Training and Coaching Facilities, Use of eLearning, and Student Academic Achievement have an insignificant role in more than three variables, i.e., eLearning, Training and Coaching Facilities, Use of learning, and Student Academic Achievement. However, it was significant for Perception about eLearning, whereas the rest of the demographics were reported to have a significant difference of mean scores with the research variables of the study.

The findings of this study suggest that research students generally are flexible, eager to learn, and open to innovative learning technologies. Since a positive relationship was found between the perceptions of elearning, which is enough evidence that led us to infer that elearning is beneficial for research students. Yet, we observed that a fine-tuned balance of operations and learners is vital to the use of technology in education. However, one cannot consider that learners will accept the use of elearning since the literature suggests that the use of advanced technology with complications limits elearning strategies. Therefore, it is imperative to consider the possibility of user resistance while devising plans for innovative uses of technology in learning at higher education institutions. If induction and planning for elearning are appropriately developed and executed as the findings of our study confirm, then the perception of students for elearning will also improve once a student experiences its benefits. Thus, with good experience of elearning, there are greater chances that students will acknowledge and engage in such experiences enthusiastically.

Our study has investigated the perception of students on elearning technology in public and private sector higher education institutions. Based on the findings and discussion, we conclude that research students are central to the successful execution of elearning management systems in higher education institutions, and all possible efforts should be made to keep in view the principle of end-user computing, usefulness, and ease of use. While developing an elearning system, besides the technical dimensions, the developer should not play down the orgware and peopleware in an organization. Technology should be given a human face to avoid disturbances and resistance, such as a list of complaints from the learners as well as the teachers and instructors. This way students will be able to relate the learning material with the method of learning through a teacher or with peer learners to fully reap the benefits of being face-to-face without being in a face-to-face mode of teaching and learning. This will be helpful for better comprehension of how to enhance the learning experience with the online mode of teaching. Though students are well aware and equipped with these innovative technologies, it seems that they need to understand, with help of their teachers, the more robust and coherent mechanism to become more efficient and effective users of elearning systems because teachers are there to plan, organize, and implement teaching-learning activities in higher education institutions. Our study suggests a systematized and well-contrived approach to elearning in higher education institutions that will empower the students to benefit from the online mode of teaching in their studies and research.

Contributions and Implications for the Future

The findings of the current study will be effective in assisting different stakeholders, including university teachers, students, and administrators. Computers are making changes in every sector of society and higher education will be the most affected by technological interventions. The role of ICTs in higher education needs to be explored so that its impact could be managed properly and in a way that favors university constituents. Healthcare researchers can use the research model of this study for their research projects after necessary modifications. The findings will be an addition to the existing body of knowledge on the digitization of learning systems. This study suggests

that it is imperative to further study the auxiliary antecedents that could also be the critical factors concerning elearning. Healthcare researchers can extend this model by adding some new variables as predictors and mediators, for example, academic engagement and eReadiness, etc., (Henrie et al., 2015). Similarly, demographic factors like experiences of technology adoption and parents' support during early ages may need to be investigated by future studies. Future researchers could also investigate different levels of adoption for elearning environments in higher education institutions, demographic factors, experiences of technology adoption, parental support, and different levels of adoption concerning elearning environments.

POLICY GUIDELINES

The current study mainly emphasizes healthcare's higher education institutions in Pakistan intending to provide them with the managerial insights. The leadership of higher education institutions need to pay attention to almost all dimensions but most importantly to the responsiveness as well as the assurance to improve the service quality since the attitude in these institutions is mostly nonprofessional. Furthermore, enhancing technology is of prime significance; therefore, higher education institutions must focus on elearning to facilitate their institutions. This research is a valuable policy guide and a contribution to Pakistan's economy, and government is needed to expand the educational plans by justifying the expenses for digital modes of teaching and governance to reap maximum benefits and returns through an assessment of the services. This study would give aid and guidance to future researchers and scholars, and it would help policy formulating authorities deliberate on the significant results presented in this study to make digital platforms more effective.

LIMITATIONS

This study was conducted to investigate the relationship between elearning and the achievement of healthcare research scholars in higher education institutions in a developing country. Since this study is limited to one region of a developing country and used a small sample size from Pakistan, there arises a question about the study's generalizability. Therefore, there is a need to test this model to study elearning systems and students' perceptions in other settings, regions, and countries to collect evidence on the generalizability of the model.

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DECLARATION OF INTEREST

The author declares that there is no clash of interests.

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