IMPACT OF BLACKBOARD TECHNOLOGY ACCEPTANCE ON STUDENTS LEARNING IN SAUDI ARABIA

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ABSTRACT

The information revolution has transformed higher education. After the COVID-19 pandemic, teachers and instructors were encouraged to improve technology-enhanced teaching methods. Furthermore, various factors influenced the adoption of internet and digital-based technologies as an aspect of teaching methodology, including its usefulness, ease of use, supporting environment and attitude towards technology. This research employed the Technology Adoption Model (TAM) to assess student acceptance of Blackboard Learn at Saudi Arabian universities. We investigated via Blackboard Learn the technology usefulness, perceived ease of use, and impact on attitudes regarding student performance and technology acceptance. This study established that the readiness of learning through the Blackboard platform depended on the user's acceptance of it and its perceived benefits on student learning outcomes. We implemented an exploratory study design in Saudi Arabia, focusing on 500 respondents to survey questionnaires and interviews with those who attended government and private universities. We investigated the influence of numerous predictor variables on the equation using Hierarchical Regression. Computer anxiety, demographic factors, technological complexity, convenience, and self-efficacy did not support any correlation with Blackboard Learning. However, perceived usefulness and perceived ease of use demonstrated a significant impact on Blackboard learning.

Key Words*: blackboard learning, students learning, perceived ease of use, learning, higher education*

INTRODUCTION

Education is a critical component of societal and national development. Technology education is becoming a vital element of daily life and has become a requirement to thrive in our globalized world (Dogan et al., 2019; Kearney et al., 2018; Royle et al., 2014; Al-Shargabi & Sabri, 2015). The use of the Internet is also increasing due to the rapid development of communication and elearning technology (Gündüz, 2015; Parlakkılıç, 2014). The information revolution has significantly shifted the lifestyle, work pattern (Cherry, 2014), and decision-making capabilities of people (Alexandre et al., 2016). Marketing information systems have a significant impact on the decisionmaking systems in an organization (Al-Momani & Al Assaf, 2020). Similarly, education diversity is seen to have a positive impact on innovativeness (Nkiru et al., 2019).

As a result, internet-based education is a critical discipline for developing the skills required to create a knowledge society. The advancement of information and communication technologies has not only resulted in the establishment of wholly online higher education institutions, it has also allowed many traditional colleges to launch fully online degree programs (Semsettin, 2015).

Moreover, during the COVID-19 pandemic, elearning becamd a viable method for delivering knowledge to students (Al-Shargabi et al., 2021; Fakhri et al., 2021).

The United Kingdom, Australia, and Denmark implemented Interactive WhiteBoards (IWB) in their Departments of Education (Kearney et al., 2018; Wong et al., 2014). Although academic technology integration has been weak, teachers are now urged to develop technology-enhanced teaching methods (Cuban et al., 2001; Dunn & Rakes, 2010; Ertmer, 1999). Students' learning is significantly influenced by elearning (Bhagat & Chauhan, 2021), and teachers are adopting technologies as part of their teaching methodology because of their beliefs and attitudes towards technology as well as its usefulness, ease of use, supporting environment, and subjective norm (Al Meajel & Sharadgah, 2018; Blackwell et al., 2014; Ertmer, 1999). The main focus of higher education technology is on attitudes, beliefs, self-efficacy, and other social cognitive characteristics (Dusick, 1998; Groves & Zemel, 2000; Huang et al., 2019; Mitra et al., 1999; Spotts, 1999). The Technology Acceptance Model (TAM) is dependent on a technology's usefulness and perceived ease of use (Martins & Kellermanns, 2004). Perceived ease of use relates to the easiest manner of using the technology (Park, 2009; Venkatesh & Davis, 1996), while perceived usefulness refers to the user's opinion of and belief that the technology could be helpful for them and optimize their work (Lee & Lee, 2008).

Therefore, in this study we propose a model that evaluates technology usefulness, perceived ease of use, and its possible impact on attitudes toward student performance and technology acceptance through Blackboard learning. We establishe by using TAM a relation between the readiness of learning through the Blackboard platform, which depends on the user's acceptance of it and its perceived benefits on student learning outcomes. Moreover, our goal is to explain how technology education arose in Saudi Arabia. The research also reveals how technology education affects students' learning. In addition, weemphasize the critical evaluation of Blackboard Learn as a medium of online learning among students of Saudi Arabian universities and colleges.

LITERATURE REVIEW

Online learning services have been developing since 1994 (Watkins et al., 2008). Several studies have looked at the effect of technology on the field of education (Abdullahi, 2013; Arteaga Sánchez et al., 2014; Kreijns et al., 2013; Sabi et al., 2016). According to Solar et al. (2013), technological implementation improves the quality of education as well as the teaching quality. Moreover, the effect of technology on learning outcomes is uncertain, and that there is no significant impact on education (Lin et al., 2014). Based on Wastiau et al. (2013), the information and communications technology (ICT) application in education has a good impact, while Venkatesh et al. (2014) found no actual impacts based on students' socioeconomic backgrounds. The mixed results confirm the inadequacy of the current empirical evidence of technology implication on education and shows the absence of a well-developed and reliable framework for technology implementation. The qualitative approaches used in previous studies validated enhancement of the student performance and learning outcomes after adopting ICT as a component of their academic curriculum (Basri et al., 2018).

It is critical to embrace and merge education with technology to enrich and strengthen the quality of education while also increasing the productivity of teachers (Khan & Qudrat-Ullah, 2021). Saudi Arabia's national policy has prioritized the implementation of technology in education, which has seen many stages of growth from gradual to rapid (Sabri et al., 2020). Saudi Arabia has taken several initiatives to enhance technology in different spheres and domains of the country (Ali, 2020). Several initiates have been taken by the government to create a framework for a technology-motivated educational environment in the country (Alkahtani, 2016). In 2004, ICT related reforms were launched in academic schools and institutions, where gradually the institutions' libraries were transformed into digital libraries, resulting in about 1,500 learning resource centers in 2008 (Mansour, 2021; Oyaid, 2009). Academics were notified about the requirement for and importance of teaching with technology. Learning resource centers play a significant role in promoting student self-development and teaching excellence that bring a shared culture and uplift the quality of education in Saudi Arabia (Alenezi, 2017).

2.1 Impact of Technology Education on Students

Today, online learning has become the most widely used form of distance education (Bartley & Golek, 2004; Huang et al., 2019). Online learning offers an excellent platform for content distribution that is not constrained by location or time, enabling instruction to be accessed by students at any time from any location (Al-Shargabi et al., 2021). The online portal is one of the most flexible ways for students to incorporate their education with their busy schedules. This includes convenience, greater learning (better understanding of course material, concentrating on technology skills, more meaningful conversations, increased writing ability, and practical skills including time management, independence, and self-discipline). It also levels the field and promotes engagement, increasing discussion and interaction between students and teachers and amongs students' as well as allowing the students will be more active than passive. These are some of the main advantages of online learning. Furthermore, Bozkurt Altan & Köroğlu (2019) mentioned that teacher interaction improved students' engagement and group work skills. They showed that students improved their ability to connect when their daily routines were fun and they were motivated to learn in the course. Academics and teachers also have positive views on the acceptance, use, and usefulness of technology education (Bozkurt Altan & Köroğlu, 2019). Among the benefits of online learning is its versatility in providing education and career advancement, its cost-effectiveness in addressing higher education prices, and its potential to provide a world-class education to anyone with access to the internet (Bartley & Golek, 2004; De la Varre et al., 2010; Erişti & Tunca, 2012; Gratton-Lavoie & Stanley, 2009; Holzmann et al., 2020; Mansour, 2021). according to Agarwal and Pandey (2013), elearning is becoming the preferred method for training teachers in higher education.

Saudi Digital Libraries (SDL) play a vital role in learning and higher education institutions in Saudi Arabia (Gangwani& Alhaif, 2020). Elearning is less expensive than traditional methods and it can be performed at any time and in any venue, allowing students and teachers to be more flexible. Technology adoption in the current academic system was restricted to administrative tasks like registration and staff scheduling, but elearning gradually has been transformed from just the automation of educational process by developing Learning Management Process using Blackboard as part of technology adoption. Students and teachers are given the benefit of remotely accessing course content and specialized learning tools to learn (Huang et al., 2019). Academic success enhances existing skills and knowledge, and builds character, while the student progresses from lower to higher stages. The purpose of examining academic performance in terms of ICT adoption is to show that the two factors have a significant link (Holzmann et al., 2020). Web-based learning also enhances decision support systems (Lee, 2006), where teachers can evaluate students' performance in real time.

2.2 Elearning using the Technology Adoption Model

Fred Davis, Richard Bagozzi, and Paul Warshaw created the TAM framework (Davis et al., 1989), as shown in Figure 1. TAM substituted many of the attitudes of Theory of Reasoned Action and instead evaluated adoption by incorporating user incentive elements (such as perceived usefulness of technology, perceived ease of use, and attitudes toward technology) as well as outcome factors (which are using technology and behavioral intentions). The main variables, Perceived Usefulness (PU) and Perceived Ease of Use (PEU), define the results directly or indirectly. External variables that describe PEU and PU variance are frequently linked to these variables. Subjective Norms (SN), Self-efficacy (CSE), and Facilitating Conditions (FC) were all found to be robustly correlated to TAM core variables, though to various degrees (Schepers & Wetzels, 2007). In comparison to contextual factors, these external variables reflect personal capabilities. Their descriptions, on the other hand, differ between studies, necessitating clear definitions in the existing meta-analysis. In the social science setting of the structures, TAM became the most widely used and published model (Huang et al., 2019). People's feelings regarding behavioral intention success, either negative or positive, are measured by their perceived utility and PEU, according to this theory (Davis, 1989). In TAM's original theory, PEU is thought to measure perceived utility. In addition, the attitude of a system and its perceived utility determine behavioral intention (i.e., the degree to which people act or do not act for a provided potential behavior). Furthermore, behavioral intention drives actual use, which is defined as how a system is used (Davis, 1989). Besides, Sukendro et al. (2020) employed TAM and its acceptance in elearning, which helped set up a conceptual framework of the research on the Blackboard technology adoption. We discovered a positive correlation among conditions that support Perceived Ease of Use and Perceived Usefulness.

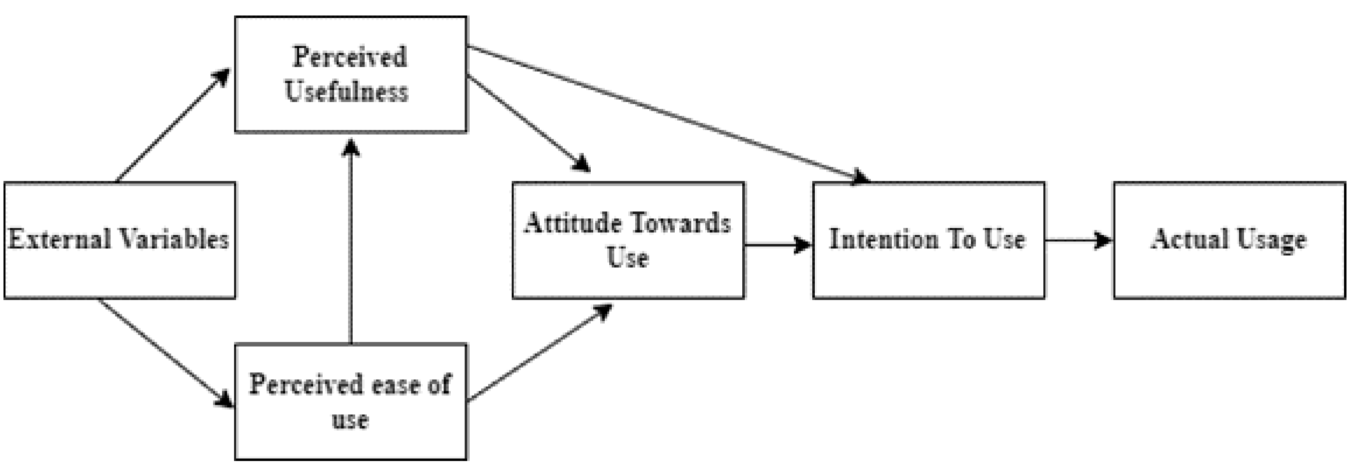
2.3 The Emergence of Technology Education in Saudi Arabia

In 1994, Saudi Arabia made the internet available to medical, academic, and research institutions, and King Fahd University of Petroleum and Minerals in Dhahran was the first university in Saudi Arabia to connect to the Internet in 1993. In 1997, the wider populace was given access to the internet, while in 1999, colleges and other government entities were given access. The King Abdul Aziz City of Science and Technology (KACST) decided to fund research in three areas: internet technology and education, internet technology implications for education, and internet technology influence on distance education. Saudi Telecom Company (STC) has also introduced an asymmetric digital subscriber line (ADSL) service for the Kingdom, which greatly lowered the cost of internet service. All universities were able to develop and apply better web-based manuals due to ADSL. In 2002, Saudi Arabia had 11 universities, over 24,000 schools, more than 30 colleges, and 48 women's colleges throughout the nation (Alqarni, 2015).

In 2003, the King Fahad University of Petroleum and Minerals teamed up with Aum Alqura University to establish an elearning center dedicated to the advancement of education through technology. King Abdulaziz University created the Deanship of eLearning and Distance Education in 2004. Further, 2006 marked a watershed moment in Saudi Arabia's elearning development. In collaboration with the Ministry of Education and educational programmers from Saudi television, the Distant Learning National Center developed distance learning and elearning (Alqarni, 2015). Saudi Arabia has proposed a national plan for the country's adoption of information technology. The scheme emphasizes successfully employing technology towards elearning and distance education in higher education. Saudi Electronic University was developed in 2010 for offering full-time and elearning programs in collaboration with different universities of the country (Erişti & Tunca, 2012).

Saudi online learning faces several challenges (Khalil et al., 2020). Saudi Arabia intends to implement information technology throughout the nation. The proposal suggests that distance learning and elearning be implemented along with their potential application in higher education institutions. In 2009, the Ministry of Higher Education and the National Center for E-learning and Distant Learning jointly hosted the first international conference on distance learning and elearning. Tabuk University also established a Division of Distance Education. In 2010, the Saudi Arabian higher education institutions' online education list was fully publicized and approved. King

Figure 1. Technology Acceptance Model



Abdullah Ibn Abdul-Aziz Al Saud, the Premier and Chairman of the Higher Education Council, ratified the Council's decision in 2011 to establish Saudi Electronic University. The first distance education graduates from King Abdulaziz University in Jeddah were conferred in 2011-2012, making it a watershed moment in Saudi Arabian history.

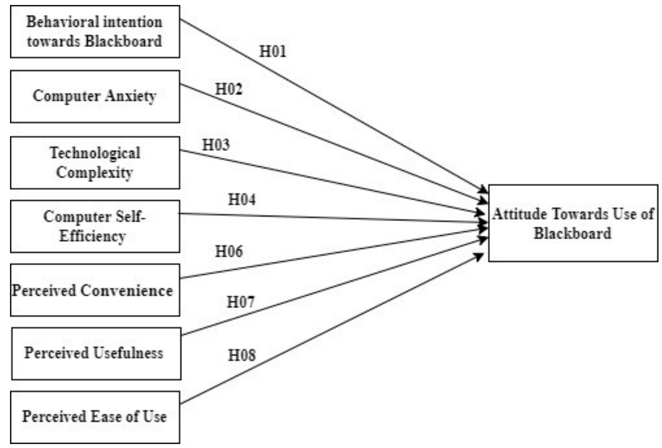
3 RESEARCH METHODOLOGY

We employed an exploratory research design to achieve the study's goal. This study was carried out in Saudi Arabia, focusing on government and private universities. Around 500 respondents were selected randomly from five public and two private Saudi Arabian universities. The primary data were collected by survey questionnaires and interviews. We framed a structured questionnaire to measure the level of adoption of Blackboard Learn and evaluate students' performance using this technology. The questionnaire consisted of variables that defined users' adoption level and their outcomes. The questionnaire also explored demographic information and evaluated the students' Blackboard experience.

Figure 2 shows the model, which shows the antecedent factors and looks at the correlation between Demographic Behavioral Intention towards Blackboard, Technological Complexity, Computer Anxiety, Computer Self-Efficacy, Perceived Usefulness, Perceived Convenience, and Perceived Ease of Use. We expected these to show a significant (negative or positive) impact on student attitude toward Blackboard use. As a result, there are seven hypotheses to test in the model:

- $H_0$1. Demographic Behavioral Intention does not have an impact on Blackboard learning.
- $H_0$2. Computer Anxiety does not impact Blackboard learning.
- $H_0$3. Technological Complexity does not have an impact on Blackboard learning
- $H_0$4. Computer Self-Efficacy does not have an impact on Blackboard learning.
- $H_0$5. Perceived Convenience does not have an impact on Blackboard learning.
- $H_0$6. Perceived Usefulness does not have an impact on Blackboard learning.
- $H_0$7. Perceived Ease of Use does not have an impact on Blackboard learning.

Figure 2. The Theoretical Framework for Measuring the Attitude Towards the Use of Blackboard



We studied the existing theories and then tested the hypotheses emerging from those theories (Wilson, 2014). For this study, we devised a quantitative data collection approach where data were collected through predefined instruments to yield statistical data analysis. In addition, qualitative data were collected from the students at Saudi universities for further consideration. The qualitative study was supposed to have a more flexible interaction with the respondents because it is less structured but more intense compared to questionnaire-based interviews. Therefore, the generated information provided a better context and greater understanding (Saunders et al., 2009).

3.1 Target Population

The word "target population" is used to describe a group of people used to get information (Gail, 2000; Rothman, 2008). The target population is as a guiding mechanism in constructing the list of sample frames or population elements from which the sample might be derived. In our study, the adult user above 18 years of age was the target population, where both genders were targeted.

The study was performed in Saudi Arabia, focusing on a mixed demographic population studying at universities, including the teaching staff. We used random sampling is as it is considered the best form of a probability sample. We randomly selected 500 students from five universities in Saudi Arabia via purposive sampling. We also interviewed the students and teachers to get greater insight into the information.

4 DATA COLLECTION

We used a questionnaire and interviews to gather primary data. A desk-based approach was used for collecting secondary information gathered from previous studies on similar topics and academic publications. The nature of the collected data can be interpreted from the frequency counts in Table 1. There are significantly more female respondents (51.2%) compared to male respondents (48.8%), and the majority of all respondents were Saudi nationals. There are more female students studying in university as compared to previous years. Online learning is emphasized in the second to fourth years, which is 77% among the respondents.

4.1 Test Applied

We used Hierarchical Regression to investigate

Table 1. Frequency Counts for Selected Variables (N = 500)

Variable	Category	n	%
Gender	Male	244	48.8
	Female	256	51.2
Race/Ethnicity	Saudi	495	99
	Non-Saudi	5	1
Age Range	15–20	4	0.8
	20–25	93	18.6
	25–30	261	52.0
	30–35	98	19.6
	35–40	28	5.6
	40–45	16	3.2
Year in the University	First	81	16.2
	Second	129.5	25.9
	Third	147	29.4
	Fourth	142	28.5
Years Learning Online	1–2	92	18.4
	2–4	385	77
	4–6	23	4.6
Years Learning Traditional	1–3	0	0
	3–6	0	0
	6–15	300	60
	16–20	96	19.2
	21 years or more	104	20.8
Current Content Area	Business Administration	48	42.9
	Computer Science	18	16.1
	Science	24	21.4
	Arts	12	10.7
	Literature	3	2.7
	Other	7	6.3

the influence (change in R^2) of several predictor variables depending on their application to the equation. Input variables based on research and theory are allowed in Hierarchical Regression analysis (Brace et al., 2016). A common method for examining the impact of a predictor variable after having control over other variables is hierarchical regression analysis (Brace et al., 2016). Correlations are often used to calculate and determine the relationship between variables to evaluate the hypothesis of multicollinearity and singularity.

4.2 Data Analysis and Interpretation

We collected then entered data into an Excel spreadsheet and exported that to SPSS 25. Exploratory research was used to analyze the continuous and categorical data, which was presented as percentage, mean, and standard deviation, while other proportions were analyzed using the chi-square test. Factor and regression are also applied, where $p < 0.05$ was used as a significant value for consideration.

Davis (1989) established a redesigned six-item scale to measure Perceived Usefulness and Perceived Ease of Use. We utilized a redesigned four-item scale to measure technological complexity (Thompson et al., 1991). The Perceived Convenience was measured utilizing a modified four-scale (Yoon & Kim, 2007). Besides that, computer self-efficacy was evaluated using a ten-item scale adapted from Compeau and Higgins (1995). In contrast, Computer Anxiety was examined utilizing the 19 items included in Computer Anxiety Rating Scale introduced in Heinssen et al. (1987). In addition, Venkatesh et al. (2003) suggested three modified scale elements to assess Behavioral Intention. Finally, attitude toward use was assessed utilizing a four-item, seven-point semantic differential rating scale created by Venkatesh and Davis (1996) and suggested by Fishbein and Ajzen (1975). The above mentioned scales were further perfected and reframed as Behavioral Intention towards the use of Blackboard technology in the current study. Here, behavioural intention towards the use of technology was further refined and redefined as Behavioral Intention towards the use of Blackboard technology. Likewise, attitude toward technology was renamed attitude toward Blackboard technology.

Cronbach's alpha reliability coefficients range from α = .84 to α = .96 as indicated in Table 2. This implies that the internal reliability of all scales is adequate (Warner, 2013). The standard deviation and mean were both comprised in the data. For the sample (N = 500) (i) M = 1.78, for Computer Anxiety, SD = 0.39 on an 18-item scale, (ii) M = 7.80, for Computer Self-Efficacy, SD = 2.00 on a 9-items scale, (iii) M = 4.12, for Technological Complexity, SD = .073 on a 4-item scale, (iv) M = 6.06, for Perceived Convenience, SD = 0.94 on a 4-item scale, (v) M = 5.70, for Perceived Usefulness, SD = 1.14 on a 6-item scale, and (f) M = 5.78, for Perceived Ease of Use, SD = 1.11 on a 6-item scale. On the other side, the Blackboard learning has a mean and SD of M = 6.12, SD = 0.76 on a 7-item scale (as demonstrated in Table 3).

Table 2. Variable Reliability Assessment

Construct of Study	Cronbach's alpha, α	Representative
Perceived Usefulness	0.98	(Davis, 1989)
Perceived Ease of Use	0.94	(Davis, 1989)
Perceived Convenience	0.93	(Yoon & Kim, 2007)
Computer Self-Efficacy	0.95	(Compeau & Higgins, 1995)
Computer Anxiety	0.95	(Heinssen et al., 1987)
Technological Complexity	0.88	(Thompson et al., 1991)
Behavioral Intention towards Technology	0.91	(Venkatesh et al., 2003)
Attitude Towards Use of Technology	0.96	(Thompson et al., 1991)

Table 3. Psychometric Characteristics Scale Scores (N = 500)

Scale	Number of Items	M	SD	Low	High	α
Technology Acceptance	7	6.12	0.76	4.00	7.00	.91
Computer Anxiety	18	1.78	0.39	1.16	3.11	.84
Computer Self-Efficacy	9	7.80	2.00	1.00	10.00	.96
Technology Complexity	4	4.12	0.73	1.00	5.00	.90
Perceived Convenience	4	6.06	0.94	3.00	7.00	.92
Perceived Usefulness of Blackboard Technology	6	5.70	1.14	2.00	7.00	.95
Perceived Ease of Use Blackboard Technology	6	5.78	1.11	2.00	7.00	.95

4.3 Correlations

Table 4 portrays the Pearson inter-correlation product-moment among the seven predictors and scale scores in which 19 out of 21 were significant $p < .001$, while all scales except one had a significant value at $p < .05$ level. The correlation involving learning with Perceived Convenience ($r = .62$, $p < .001$) and Perceived Usefulness with the Perceived Ease of Use ($r = .75$, $p < .001$) were huge and positive. Significant relationships, on the contrary, were discovered between the small to moderate scale with negative and positive (see Table 4).

Product-Moment's correlation between Blackboard learning with the demographic and experience is indicated in Table 5. The statistics data for descriptive implies that Blackboard learning is higher for female students ($r = .19$, $p < .05$), students with more years learning online ($r = .28$, $p < .005$), and younger students ($r = -.25$, $p < .01$). All six variables are shown to be strongly correlated with Blackboard learning. Acceptance of Perceived Convenience is represented by the ratings with the highest correlation value ($r = .63$, $p < .001$) (see Table 5). Furthermore, using Hierarchical Regression Analysis, the hypotheses in this research were investigated (see Tables 6 to 12).

The entire model was significant at ($p = .001$); hence the null hypothesis was rejected. Blackboard learning was observed lower for students having a higher age group ($\beta = -.20$, $p = .02$), and greater for students with more years learning online ($\beta = .29$, $p = .003$). Hence, more exposure to online learning increases Blackboard learning, as shown in Table 6.

Computer Anxiety did not substantially contribute to students' Blackboard learning. Table 7 illustrates the hierarchical multiple regression model using Computer Anxiety into the model. The overall model was significant ($p = .001$); therefore the null hypothesis was rejected. Blackboard learning was also observed higher in female students ($\beta = .19$, $p = .03$). It was also higher for students with more years learning online ($\beta = 29$, $p = .001$) and lower for students with higher Computer Anxiety ($\beta = -.34$, $p = .001$). As a result, Computer Anxiety was inversely related to Blackboard learning.

Table 4. Inter-correlations among the Seven Summarized Scale (N = 500)

Scale	1		2		3		4	
1. Technology Acceptance	1.00							
2. Computer Anxiety	–.34	****	1.00					
3. Computer Self-Efficacy	.38	****	–.49	****	1.00			
4. Technology Complexity	–.38	****	.29	****	–.22	**	1.00	
5. Perceived Convenience	.62	****	–.47	****	.52	****	–.43	****
6. Perceived Usefulness of Blackboard Technology	.36	****	–.41	****	.53	****	–.17	
7. Perceived Ease of Use Blackboard Technology	.38	****	–.54	****	.56	****	–.35	****

* $p < .05$. ** $p < .01$. *** $p < .005$. **** $p < .001$.

Table 5. Pearson's Correlation Variables with Blackboard Learning (N = 500)

Variable	Acceptance	
Gender	.19	*
Age Range	–.25	**
Years Learning Online	.28	***
Years Learning Traditional	.03	
Computer Anxiety	–.34	****
Computer Self-Efficacy	.38	****
Technology Complexity	–.40	****
Perceived Convenience	.64	****
Perceived Usefulness Blackboard Technology	.38	****
Perceived Ease of Use Blackboard Technology	.37	****

* $p < .05$. ** $p < .01$. *** $p < .005$. **** $p < .001$.

Table 6. Hierarchical Regression Model Students Blackboard Learning on Demographics and Experience Variables (N = 500)

Variable	*B*	*SE*	β	*t*	*p*
Intercept	5.74	.49		11.47	.001
Gender	.27	.18	.16	1.63	.10
Race	–.18	.17	–.08	–1.01	.30
Age Range	–.18	.07	–.20	–2.23	.02
Years Learning Online	.27	.11	.29	2.90	.003
Years Learning Traditional	.00	.08	.00	–.02	.99

Full Model: F (5, 105) = 4.29, p = .001. R^2 = .168, p = .001.

Table 7. Hierarchical Regression Model for Blackboard Learning Depending on Previous Variables while Integrating Computer Anxiety (N = 500)

Variable	*B*	*SE*	β	*t*	*p*
Intercept	6.78	.54		12.80	.001
Gender	.36	.17	.20	2.18	.03
Race	−.11	.17	−.05	−.67	.49
Age Range	−.11	.07	−.13	−1.49	.13
Years Learning Online	.29	.08	.29	3.33	.001
Years Learning Traditional	−.04	.06	−.06	−.72	.45
Computer Anxiety	−.67	.16	−.34	-4.05	.001

Full Model: F (6, 106) = 6.87, p = .001. R^2 = .280. Δ R^2 = .112, p = .001.

As indicated in Table 8, the entire model was significant at (p = .001). Blackboard learning was (Δ R^2 = .028, p = .05); thus, the null hypothesis was rejected. The students having more years learning online was (β = .28, p = .005) and for those having greater Computer Self-Efficacy was (β = .21, p = .05). In the meantime, Computer Self-Efficacy was (β = .21, p = .05) while Computer Anxiety was (β = −.26, p = .01). Therefore, Computer Anxiety was inversely proportional to Blackboard learning, whereas Computer Self-Efficacy was inversely proportional to Blackboard learning.

Table 8. Hierarchical Regression Model for Blackboard Learning Depending on Previous Variables while Integrating Computer Self-Efficacy (N = 500)

Variable	*B*	*SE*		*t*	*p*
Intercept	5.72	.75		7.77	.001
Gender	.38	.17	.21	2.36	.03
Race	−.09	.19	−.05	−.47	.66
Age Range	−.10	.09	−.11	−1.08	.30
Years Learning Online	.28	.10	.28	2.91	.005
Years Learning Traditional	−.05	.08	−.07	−.64	.54
Computer Anxiety	−.51	.20	−.26	−2.64	.01
Computer Self-Efficacy	.09	.05	.21	2.04	.05

Full Model: F (7, 107) = 6.66, p = .001. R^2 = .310. Δ R^2 = .029, p = .05.

The general model was significant (p = .001) with variance (Δ R^2 = .075, p = .001). As a result, the null hypothesis was rejected. Blackboard learning appeared to be greater for female students (β = .17, p = .03), where students who may have spent more time studying online was (β = .29, p = .001) and students having greater Computer Self-Efficacy rates was (β = .16, p = .06). Furthermore, Blackboard learning was seen to be less effective for students with higher Computer Anxiety scores level (β = −.18, p = .04) and Technological Complexity scores (β = −.29, p = .001) as presented in Table 9.

Table 9. Hierarchical Regression Model for Blackboard Learning Depending on Previous Variables while Integrating. Technology Complexity (N = 500)

Variable	B	SE	β	t	p
Intercept	4.24	.80		5.23	.001
Gender	.32	.14	.17	2.22	.03
Caucasian	−.01	.16	.00	−.03	.96
Age Range	−.04	.07	−.04	−.61	.53
Years Learning Online	.29	.08	.29	3.45	.001
Years Learning Traditional	−.07	.06	−.10	−1.21	.22
Computer Anxiety	−.36	.17	−.18	−2.04	.04
Computer Self-Efficacy	.06	.03	.16	1.81	.06
Technology Complexity	.30	.08	−.29	3.53	.001

Full Model: F (8, 103) = 8.03, p = .001. R^2 = .384. Δ R^2 = .074, p = .001.

The overall model was significant at (p = .001); thus, the null hypothesis was rejected. Blackboard learning was observed to be greater for students with greater Perceived Convenience scores (β = .33, p = .001) and for students having more years learning online (β = .20, p = .01) as shown in Table 10.

Table 10. Hierarchical Regression Model for Blackboard Learning depending on Previous Variables while Integrating Perceived Convenience (N = 500)

Variable	B	*SE*	β	*t*	*p*
Intercept	3.22	0.78		4.06	.001
Gender	.17	.13	.10	1.24	.20
Caucasian	−.01	.15	.00	−.05	.94
Age Range	−.05	.06	−.06	−.83	.39
Years Learning Online	.20	.07	.20	2.44	.01
Years Learning Traditional	−.07	.05	−.10	−1.29	.19
Computer Anxiety	−.16	.17	−.08	−.95	.33
Computer Self-Efficacy	.01	.03	.03	0.41	.67
Technology Complexity	.17	.08	.16	2.07	.03
Perceived Convenience in Blackboard Technology	.33	.07	.41	4.12	.001

Full Model: F (9, 102) = 10.12, p = .001. R^2 = .472. Δ R^2 = .087, p = .001

Table 11 indicated the findings of the hierarchical regression model while integrating Perceived Usefulness and observed overall model score to be significant at (p = .00). Additionally, the variable included did not substantially add additional variance (Δ R^2 = .005, p = .27) in Blackboard learning. Hence, the null hypothesis was accepted.

Table 11. Hierarchical Regression Model Showing Student Acceptance of Blackboard Depending on Previous Variables and Perceived Usefulness (N = 500).

Variable	*B*	*SE*	β	*t*	*p*
Intercept	3.01	.82		3.71	.001
Gender	.15	.13	.08	1.10	.26
Caucasian	–.01	.15	–.01	–.10	.90
Age Range	–.05	.05	–.05	–.82	.40
Years Learning Online	.21	.08	.21	2.53	.01
Years Learning Traditional	–.08	.05	–.10	–1.34	.17
Computer Anxiety	–.17	.17	–.06	–.78	.42
Computer Self-Efficacy	.00	.03	.00	.01	.97
Technology Complexity	.18	.07	.16	2.14	.02
Perceived Convenience in Blackboard Technology	.32	.07	.39	3.86	.001
Perceived Usefulness of Blackboard Technology	.06	.05	.9	1.07	.27

Full Model: *F* (10, 101) = 9.23, *p* = .001. *R*^2 = .477. Δ *R*^2 = .005, *p* = .27.

Table 12 illustrates the hierarchical multiple regression model while integrating Perceived Ease Of Use. The scores show that integrating this variable did not contribute to increased variances in the model. The variance in Blackboard learning acceptance was only 0.5%, which is represented by (Δ R^2 = .005, p = .30). Hence, the null hypothesis was accepted.

We may conclude from the data analysis of Table 3–12 that $H_0$1, $H_0$2, $H_0$3, $H_0$4, and $H_0$5 on Blackboard learning hold a significant effect on Blackboard learning, and thus the stated hypothesis was rejected. On the contrary, $H_0$6 and $H_0$7 were accepted as Perceived Usefulness and Perceived Ease of Use did not impact learning, as shown in Table 13.

Table 12. Hierarchical Regression Model for Blackboard learning Depending on Previous Variables while Integrating Perceived Ease of Use (N = 500)

Variable	*B*	*SE*	β	t	p
Intercept	3.18	.82		3.83	.001
Gender	.13	.13	.07	.97	.31
Caucasian	–.02	.15	–.01	–.12	.87
Age Range	–.06	.06	–.07	–.94	.32
Years Learning Online	.19	.07	.20	2.44	.02
Years Learning Traditional	–.07	.05	–.10	–1.30	.18
Computer Anxiety	–.17	.17	–.08	–.97	.32
Computer Self-Efficacy	.00	.04	.01	.9	.91
Technology Complexity	.19	.08	.18	2.28	.02
Perceived Convenience	.33	.07	.41	4.00	.001
Perceived Usefulness of Blackboard Technology	.11	.07	.17	1.50	.14
Perceived Ease of Use Blackboard Technology	–0.09	0.09	–.13	–1.04	.30

Full Model: *F* (11, 100) = 8.50, *p* = .001. *R*^2 = .482. Δ *R*^2 = .005, *p* = .30.

Table 13. Summary of Hypothesis and Results

Hypothesis	Hypothesis Statement	Result
Ho1	Demographic Behavioral Intention does not have an impact on Blackboard learning.	Rejected
Ho2	Computer Anxiety does not impact Blackboard learning.	Rejected
Ho3	Computer Self-Efficacy does not have an impact on Blackboard learning.	Rejected
Ho4	Technological Complexity does not have an impact on Blackboard learning.	Rejected
Ho5	Perceived Convenience does not have an impact on Blackboard learning.	Rejected
Ho6	Perceived Usefulness does not have an impact on Blackboard learning.	Accepted
Ho7	Perceived Ease of Use does not have an impact on Blackboard learning.	Accepted

DISCUSSION

The data analysis and results show that Blackboard learning has either a positive or negative relationship with the variables. More years of learning online have a significant positive impact on Blackboard learning. Hence, those students who are technically strong in IT or students whose elementary education involved using smart technologies are observed with higher learning while using Blackboard technology.

In contrast, a negative association is observed with age, technological complexity, and computer anxiety. Blackboard learning is found to be lower among older students as compared to younger students. Here, older students are the segment of those students who might have dropped out from their studies in the past and are now enrolled in distance education to continue their studies. Hence, their level of enthusiasm and cooperation is lower while using Blackboard technology. While evaluating the ethnicity/race, the population lacked diversity and ethnicity does not have much significance on learning through Blackboard technology. Moreover, we observed that Computer Anxiety has the maximum variance score, which can be interpreted that computer anxiety presents significant resistance towards students' learning using Blackboard technology. A positive association exists between learning and computer self-efficacy, according to the findings. Through the use of Blackboard technology, computer self-efficacy improves learning. According to the findings of this study, there is a negative association between technology complexity and student learning. Furthermore, there is a significant correlation between learning qualities and perceived convenience; however, perceived usefulness does not provide any further differences in learning via Blackboard technology. As a result, there is a negative link involving perceived usefulness and learning, with Blackboard technology improving learning. Other than that, perceived ease of use does not contribute any variation. As a result, it is possible to say that there exists a negative association between perceived ease of use and Blackboard learning.

5. CONCLUSION

We used TAM to assess the learning outcome among the students using Blackboard technology as a learning platform component. Our research identified variables that have a favorable and negative impact on Blackboard-based online learning. To close the gap between lecturer and student learning, it is crucial to grasp the aspects involved with online learning while utilizing Blackboard technology. For example, technological complexity, computer anxiety, self-efficacy, and perceived convenience have no significant impact on online learning. In contrast, perceived usefulness and perceived ease of use have a substantial impact on Blackboard learning, according to previous studies. Furthermore, various studies have concentrated on and demonstrated that students' learning rates increased as a result of student acceptance and ease of use and online technology.

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