



Predicting behavioral intention to use e-learning system: A case-study in Begum Rokeya University, Rangpur, Bangladesh

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Abstract

Digital transformation and emerging technologies open a horizon to a new method of teaching and learning and revolutionizes the e-learning industry. The goal of this study is to scrutinize a proposed research model for predicting factors that influence student's behavioral intention to use e-learning system at Begum Rokeya University, Bangladesh. The study used quantitative approach and developed a research model based on several technological acceptance models. In order to test the model, a survey was conducted to obtain data from 262 university students. SEM-PLS, a multivariate statistical analysis technique, was used to analyze the responses to examine the model, factors, structural relationships, and hypotheses. The result shows that 'perceived usefulness' and 'perceived ease of use' positively and significantly influenced by 'perceived enjoyment'. Furthermore, 'perceived usefulness', 'perceived ease of use' and 'facilitating condition' have a significant impact to predict behavioral intention to use e-learning. The results of mediation analysis show that 'perceived usefulness' and 'perceived ease of use' have mediating effects between the predictors and the outcome. Finally, 'facilitating condition' have a remarkable moderating effect to predict the student's behavioral intention in using e-learning. The findings have a noteworthy empirical implication for educational institutions to introduce e-learning system as one of the teaching and learning tools.

Keywords E-learning · M-learning · Prediction · Behavioral intention · TAM · GETAMEL · UTAUT

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1 Introduction

1.1 Background of the study

A rapid expansion of information and communication technology (ICT) has introduced some innovative applications in the education sector. E-learning is an application which is extensively used in the educational sector nowadays (Islam, 2016). The e-learning application allows students to carry on their academic activities and to access the necessary information at any time from any place without any restriction (Althunibat, 2015). Despite having many advantages, the e-learning system has not been fully adopted in the developing countries for many reasons. But due to the current Covid 19 pandemic situation, many universities have been adopting e-learning system to continue their academic activities. Currently, the world has been struggling with coronaviruses which spread in most countries around the world. At the end of the year 2020, globally around 65 million confirmed cases have been registered and the confirmed death has reached over 1.5 million. Globally, as of 12 June 2021, there have been around 176 million confirmed cases of COVID-19, including 3.8 million deaths, reported to world health organization (WHO). In order to control the rapid spread, most of the countries has enforced lockdown or movement restriction which resulted in a critical effect in all areas of our daily life. Aside from the economy, one of the terrible hits of Covid-19 is the education sector. Therefore, traditional learning modes have been changing. E-learning system can support students and institution to build distinctive opportunities under the pandemic situation (Wang et al., 2021). Like other countries, Bangladesh has shut down all educational institutions since the beginning of the year 2020. As the UGC has recently announced a direction for universities for starting online classes. As a result, universities today are on the verge of adopting new learning systems. Although the e-learning system is prevalent in universities in developed countries, it can be called new experience in terms of practical usage especially in the higher education sector in Bangladesh. No doubt this innovative approach will surely stand as a huge challenge for both students and teachers, however, it is now becoming the utmost reality.

1.2 Problem statement and objective

The use of information technology is on the rise in the education sector and mobile devices along with the Internet are widely spread among students. Thus, e-learning system has easily taken place as an important tool in universities. Additionally, positive interest is seen among students from the perspective of acceptance and adoption of online-based e-learning. However, researchers have raised some contradictions in their studies. They disclosed that despite education institutes have increased their learning platforms to mobile services, student inquisitiveness and e-learning are not sufficiently good as anticipated (Hamidi & Chavoshi, 2018; Kim et al., 2017). Many factors influence student's acceptance and their behavioral intention. Hence, examining those factors in a diversified and consolidated approach is critical (Briz-Ponce et al., 2017; Nikou & Economides, 2017). Consequently, this research focuses on the investigation of the student's behavioral intentions in using e-learning system at

higher education institutions. Researcher paid more attention regarding e-learning after covid-19 outbreak because it is the only means to continue academic activities. A study showed that Covid-19 fear moderates the connection between the external factors and behavioral intention among students in adopting e-learning system (Qiao et al., 2021). Although, very fewer research framework has been found that can predict student's behavioral intention. Therefore, "Lack of a framework to predict behavioral intention to use e-learning system among students" is the key problem which has motivated to do this research. Objectives of this paper are (a) to propose a framework for finding behavioral intention towards using e-learning system among students of Begum Rokeya University, and (b) to find important factors affecting behavioral intention towards using e-learning system among students at Begum Rokeya University.

2 Literature review and research hypothesis

2.1 Defining the field

Table 1 illustrates the concepts of using research in the domain of e-learning and behavioral intention towards new technology.

2.2 Theoretical background

In 2016, Fazil Abdullah and Rupert Ward have established General Extended Technology Acceptance Model for E-Learning (GETAMEL) based on Davis' Technology Acceptance Model (TAM) model. The authors studied on student's behavioral intention toward e-learning for discovering the most often used external elements of Technology Acceptance Model (TAM). They found five external factors among 152 different peripheral variables—Subjective Norm, Experience, Self-Efficacy, Enjoyment, and Computer Anxiety (Abdullah & Ward, 2016). They have been analyzing the impacts of these factors on TAM's two key elements- Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) in the context of student's behavioral intention in using online-based learning system. In that research, they applied a General Extended Technology Acceptance Model for E-Learning (GETAMEL) and their findings revealed that Subjective Norm, Experience, Self-Efficacy, and Enjoyment has a positive effect on Perceived Ease of Use (PEOU), while Self-Efficacy and Enjoyment have a positive and a significant impact on student's Perceived Usefulness (PU). Computer Anxiety is not shown as a substantial predictor.

2.3 Research hypotheses development

This study has formulated 16 hypotheses based on 9 variables taken from different studies and empirically examined the student's behavioural intention (BI) from the perspective of using e-learning system in Begum Rokeya University, Rangpur, Bangladesh. Table 2 presents the list abbreviation of variables and their associated hypotheses.

Table 1 Definition of field

Field	Definition
E-learning	E-learning has been defined as an educational system that is assisted and strengthened using of ICTs (Sambrook, 2003). In other terms, e-learning is a system delivered through information and communication technology applications (Jenkins & Hanson, 2003). E-learning defined as an ICT application that incorporates a large array of instructional material like audio, video, text media, online discussion and e-mail (Lee et al., 2011)
Behavioural Intention (BI)	There is a lot of distinct interpretation of the concept of behavioral intention. Fishbein and Ajzen described that behavioral intention is a subjective probability of how a person will perform the behavior (I. Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Warshaw and Davis claimed that the meaning of intention varies as it is used in regular dialect. They classified Behavioral Intention (BI) as the level to which an individual has made deliberate strategies to perform or not to perform certain imminent behavior (Fishbein & Ajzen, 1975)

Table 2 Acronym of variables and hypothesis

No	Variables	Number of hypothesis
1	Subjective Norm (SN)	H1, H2
2	Perceived Enjoyment (PE)	H3, H4
3	Technology Anxiety (TA)	H5, H6
4	Experience (EXP)	H7, H8
5	Self-Efficacy (SE)	H9, H10
6	Perceived Usefulness (PU)	H11
7	Perceived Ease of Use (PEOU)	
8	Facilitating condition (FC)	H14, H15, H16
9	Behavioral Intention (BI)	H12, H13

2.3.1 Subjective norm (SN)

Subjective norm denotes the cognized societal pressure formed by the views of other people, based on that an individual perform or do not perform a given behavior (Scheepers & Wetzels, 2007). Social Norm (SN) and Social Influence (SI) were found to be parallel in earlier studies and they have a substantial impact on social factors in the context of using technology (Venkatesh et al., 2003). In the educational settings, the subjective norm may influence student's decision-making process in the context of adopting e-learning system by the attitude from friends, family, educators, and institutional policies. Hence, the concept, subjective norm, can be described as how a student differentiates pressure from the surrounding peers to use e-learning system. Nanayakkara et al. proved that peer-pressure has a strong relationship in the decision making process among students in the perspective of recognition of e-learning (Nanayakkara & Whiddett, 2005). In a study, Venkatesh et al. proposed TAM2 model and showed that Subjective Norm has negatively influence on PU and positively impact on the intention to use the technology (Venkatesh & Davis, 2000). Abdullah and Ward have discovered Subjective Norm has been applied in 32 studies and they confirmed the relationship with TAM in 27 studies. In those studies, the subjective norm is revealed as a major predictor of PEOU and a minor predictor for e-portfolio acceptance among students (Abdullah et al., 2016). From the previous discussion, the following hypotheses have been formed:

H1: Subjective Norm (SN) can positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

H2: Subjective Norm (SN) can positively and substantially predict Perceived Ease of Use (PEOU) in using e-learning system by students.

2.3.2 Perceived enjoyment (PE)

Perceived enjoyment differentiated as a degree to which a user's activity of using computer is seemed to be enjoyable (Davis et al., 1992). The researcher had discovered that PE has explicit impacts on user's intention, particularly, to the hedonic system that brings delight or pleasure to users (Koufaris, 2002; Venkatesh et al., 2002). PE has been studied to talk about how it impacts an individual's behavior through internal motivation in case of technology adoption (Davis, 1989; Van der Heijden, 2003; Venkatesh et al., 2002). Individuals are willing to put extra effort into the process if they are having enjoyment in that process. For this reason, PE can lessen individuals cognitive load (Agarwal & Karahanna, 2000; Deci, 1975) and substantially influenced the attitude and behavioral intention to use a personal website (Al-Gahtani & King, 1999; Moon & Kim, 2001; Van der Heijden, 2003). Abdullah and Ward have investigated several studies and found that PE has significant impacts on PU and PEOU for using e-learning. They found a considerable positive link between PE and PEOU in 73% of studies and 100% of studies respectively, they found a positive association between PE and PU for using e-learning (Abdullah et al., 2016). If students gain greater pleasure in the time of using the online-based learning system, the more affirmative attitude has emerged among students. Thus, higher intent

materialized toward the use and utility of the e-learning system. Hence the study formulated two assumptions as follows:

H3: Perceived Enjoyment (PE) can positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

H4: Perceived Enjoyment (PE) can positively and substantially predict Perceived Ease of Use (PEOU) in using e-learning system by students.

2.3.3 Technology anxiety (TA)

The term technology anxiety is developed from early studies of computer anxiety (Heinssen et al., 1987). Venkatesh et al. described computer anxiety as emotional reactions in the context of performing a certain behavior (Keikhosrokiani, 2020; Keikhosrokiani et al., 2018, 2020; Venkatesh et al., 2003). Igarria et al. also defined computer anxiety as an emotional response of an individual that usually comes from an apprehension of having trouble at the time of using a computer (Magid Igarria & Parasuraman, 1989). According to Alenezi, computer nervousness performs a substantial role in the adaptation of e-learning in higher education (Alenezi, 2012). A couple of studies investigated by Abdullah et al. found 59% of studies confirmed, computer anxiety has a negative influence on a student's PEOU in e-learning environment (Abdullah & Ward, 2016). Although Abdullah et al. didn't find the correspondence between computer apprehension and PU whereas they included two relationships with PU and PEOU separately. Therefore, this study suggested two hypotheses regarding anxiety:

H5: Technology Anxiety (TA) can positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

H6: Technology Anxiety (TA) can positively and substantially predict Perceived Ease of Use (PEOU) in using e-learning system by students.

2.3.4 Experience (EXP)

Experience is a highly significant external factor for the TAM model in predicting the intention of e-learning usage among students (Abdullah et al., 2016). The users having advance computer skills are more likely to have more positive feelings in case of accepting any online learning tool (Abdullah & Ward, 2016; Lee et al., 2013). A great deal of research on e-learning acceptance has shown that experience has an influence on student's perceived ease of use (PEOU) and perceived usefulness (PU) (De Smet et al., 2012; Lee et al., 2011). In a study, Williams et al. have exhibited that computer experience has impacted on the intention of students in using a different type of e-learning system (Williams & Williams, 2010). Therefore, the authors have taken forward two hypotheses:

H7: Experience (EXP) positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

H8: Experience (EXP) can positively and substantially predict Perceived Ease of Use (PEOU) in using e-learning system by students.

2.3.5 Self-efficacy (SE)

Self-Efficacy (SE) is defined as a user's judgement about his/her capability to conduct a certain piece of work by utilizing a computer (Bandura, 1978). Abdullah et al. discovered Self-Efficacy (SE) as the most usual external factor used in the TAM model (Abdullah & Ward, 2016; Keikhosrokiani, 2019; Keikhosrokiani et al., 2019). Self-efficacy can influence individuals' behavioral intentions in the context of using the computer. Users will avoid computer if they think and believe that it is complex to use and they can't use a computer (M. Igbaria & Iivari, 1995). Abdullah et al. showed in 41 studies that self-efficacy effects on students PEOU in an e-learning environment. And 33 studies validate that SE has a significant and positive connection with other variables. Besides, they discovered that self-efficacy has a positive effect on PEOU and a negative impact on PU in e-portfolio adaption (Abdullah et al., 2016). Thus, this study presents the assumptions of H9 and H10:

H9: Self-Efficacy (SE) can positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

H10: Self-Efficacy (SE) can positively and substantially predict Perceived Ease of Use (PEOU) in using e-learning system by students.

2.3.6 Perceived usefulness (PU) and perceived ease of use (PEOU)

In 1989, Fred D. Davis instituted an information system theory termed Technology Acceptance Model (TAM) which demonstrates how people accept and use a technology (Davis, 1989). TAM is an adopted and extending idea of Theory of Reasoned Action (TRA) introduced by Fishbein and Ajzen in 1975 (Fishbein & Ajzen, 1975). TAM includes two primary factors which influence users intention to use new technology: a) Perceived Usefulness (PU); b) Perceived Ease of Use (PEOU). Davis described PEOU as the intensity, users think that they can run a specific setup effortlessly (Davis et al., 1989). If a user perceives a system or technology is easy to operate, then the level of PEOU increases. Therefore, the acceptance and usage of those systems will also be high among students. Perceived usefulness (PU) is also a major factor which has an immediate influence on students' behavioral intention. Davis categorized PU as the level to which a user thinks that running a system would enhance one's performance (Davis, 1989). Masrom, Venkatesh and Morris emphasized that PU has a positive and considerable impact on users behavior which control intent of users to use a technology (Keikhosrokiani, 2021; Masrom, 2007; Venkatesh & Morris, 2000). Additionally, several studies have discovered the reciprocal relationship among PEOU, PU and BI (Davis, 1989; Davis et al., 1989).

H11: Perceived Usefulness (PU) can positively and substantially predict Behavioral Intention (BI) in using e-learning system by students.

H12: Perceived Ease of Use (PEOU) can positively and substantially predict Behavioral Intention (BI) in using e-learning system by students.

H13: Perceived Ease of Use (PEOU) can positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

2.3.7 Facilitating condition (FC)

Facilitating condition is described as the degree of accessibility to the means and possessions to achieve a task (Venkatesh et al., 2012). FC is a factor responsible for external control and related to the idea of facilitating resources (Taylor & Todd, 1995). If sufficient resources are accessible, students can do their tasks and feel positive attitudes towards e-learning. Facilitating conditions (FC) are confirmed as an important predictor in the context of recognizing and using of modern-day innovation (Baptista & Oliveira, 2015; Venkatesh et al., 2003). Many of studies identified that the deficiency of a facilitating infrastructure has been indicated as a significant obstacle for the implementation of online-based learning systems (Engelbrecht, 2005; Selim, 2007). Therefore, this study conveys the proposed hypothesis:

H14: Facilitating condition (FC) can positively and substantially predict Perceived Usefulness (PU) in using e-learning system by students.

H15: Facilitating condition (FC) can positively and substantially predict Perceived Ease of Use (PEOU) in using e-learning system by students.

H16: Facilitating condition (FC) can positively and substantially predict Behavioral Intention (BI) in using e-learning system by students.

2.4 Proposed research model

The current study is striving for a research model examining behavioral intention of university students in Bangladesh in using e-learning system. Figure 1 demonstrates the intended research model by deriving some existent studies on Technology

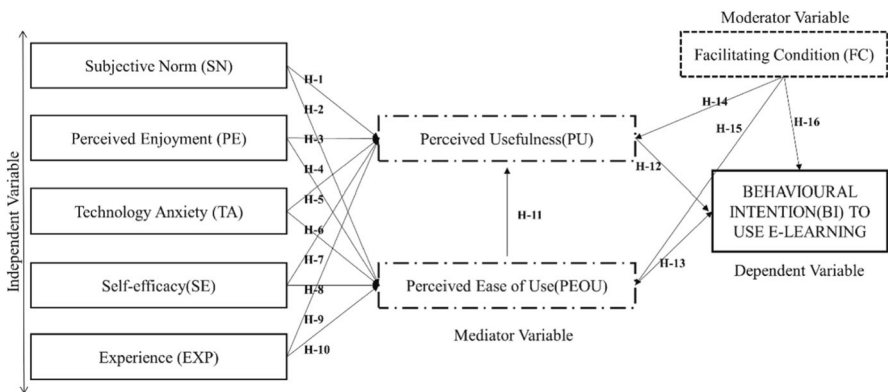


Fig. 1 The proposed conceptual model

Table 3 Type of variables

Independent variable	Mediator	Moderator	Dependent variable
Subjective Norm (SN) Perceived Enjoyment (PE) Technology Anxiety (TA) Experience (EXP) Self-Efficacy (SE)	Perceived Usefulness (PU) Perceived Ease of Use (PEOU)	Facilitating condition (FC)	Behavioural Intention (BI)

Acceptance Model (TAM) (Davis et al., 1989), Unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2012), Theory of Reasoned Action (ToRA/TRA) (Hill et al., 1977), Theory of Planned Behavior (TPB) (Icek Ajzen, 1991) and General Extended Technology Acceptance Model for E-Learning (GET-AMEL) (Abdullah & Ward, 2016). The proposed model mostly focuses on two key elements of TAM: Perceived Ease of Use (PEOU); Perceived Usefulness (PU). In addition, the five most used variables analyzed in GETAMEL are Subjective Norm, Experience, Self-Efficacy, Enjoyment, and Computer Anxiety. Facilitating condition acted as moderator which is taken from UTAUT model.

2.5 Type of variables

The proposed research model combines nine variables which affect the behavioral intention of university students in adopting e-learning system. Table 3 represents the type of variables used in the proposed research model.

3 Research methodology

3.1 Research design

In this study, a quantitative method has been applied to investigate the formulated hypotheses and suggested research model. The exploratory and deductive approach utilized in this study to explore behavioral intention towards using e-learning system among students. Begum Rokeya University, Rangpur (BRUR) has been selected as the case study for data collection because of easy volunteering and accessing by the researcher. An online survey was utilized because it confirms a cost-effective and time-efficient geographical delivery (Kurfalı et al., 2017).

3.2 Sampling and data collection

The experiment of the current research includes undergraduate and postgraduate students at Begum Rokeya University, Rangpur (BRUR) in Bangladesh.

Self-administered questionnaires distributed randomly to a total of 300 respondents over four weeks in October and November 2020. The questionnaire was prepared and distributed in English. Because English is widely used in most of the academic activities in BRUR. In the first phase, a pilot study conducted with 20 respondents to validate the questionnaire. The result was used to construct the final version of the questionnaires. The study has used a random sampling method for unbiased representation of the total population. The questionnaires have distributed electronically by Google form.

3.3 Research variable and measures

The research model of this study adapted from different theories and some variables encompassed for this study. The model incorporated the total number of nine variables including five independent variables (SN, PE, TA, EXP, SE), one dependent variable (BI), two mediators (PU, PEOU), and one moderating variable (FC). A psychometric Likert scale has been used for the measurement of the responses. The responder stated their opinion in 5-points scale stretched from 1 to 5 (strongly disagree to strongly agree) of the questions derived from the elements mentioned in the proposed model.

3.4 Design questionnaire

The questionnaire has been designed in Google form. The font and color issues were taken to consider as it has an impact on the respondent. The question kept short so that respondent can easily understand and respond. The question wording has been chosen carefully so that it does not direct the respondents to any direction. The questionnaires were developed based on previous research and modified to be relevant to

Table 4 Demographic profile of respondent

Demographic Profile (N = 262)	Frequency	Percentage (%)
Gender		
Female	74	28.2
Male	188	71.8
Age		
< = 25	249	95
26–35	12	4.6
46–55	1	0.4
Study Year		
1st Year (Bachelor)	52	19.8
2nd Year (Bachelor)	86	32.8
3rd Year (Bachelor)	34	13
4th Year (Bachelor)	82	31.3
Masters	8	3.1

Table 5 Experience on using internet, smartphone, and computer

Demographic Profile (N=262)	Frequency	Percentage (%)
Student's experience level in using mobile devices (In years)		
< = 1	17	6.5
1–3	82	31.3
3–6	80	30.5
> 6	83	31.7
Type of ICT devices owned by students		
Computer/Laptop	7	2.7
Computer/Laptop, Smartphone	57	21.8
Computer/Laptop, Smart Phone, Tablet	7	2.7
None	7	2.7
Smart Phone	183	69.8
Smart Phone, Tablet	1	0.4
Type of Internet used by students		
Broadband	23	8.8
Mobile data	189	72.1
Mobile data, Broadband	48	18.3
None	2	0.8
Comfortability using a computer, laptop, smartphone, tablet, or web application		
No	15	5.7
Yes	247	94.3
The usefulness of computer, laptop, smartphone, tablet, or web applications for educational purposes		
No	2	0.8
Yes	260	99.2

the purpose of this survey. The questionnaire contains three (3) sections with total number of 44 questions. The first section is demographic which consist of 3 question and the section-2 covers the experience of using the internet and smartphone which consist of 5 questions. The third section accumulates 36 assessment questions based on 9 variables using by the proposed research model.

3.5 Data analysis

IBM SPSS was used for analyzing the demographic data of respondent, experience of using the internet and smartphone as well as for descriptive statistics. Partial least squares structural equation modelling (PLS-SEM) is a technique of structural equation modelling which used for assessing complex cause-effect relationship models with latent variables. The study applied this method for evaluating the conceptual, structural model and hypotheses. The study used a data analysis software named SmartPLS3 for variance-based structural equation modelling using partial least squares path modelling method.

Table 6 Descriptive statistics

	SN	EXP	PE	TA	SE	PU	PEOU	BI	FC
Mean	3.86	3.89	3.84	3.73	3.48	4.01	3.82	4.18	4.40
Std. Deviation	0.71	0.76	0.72	0.77	0.74	0.69	0.63	0.61	0.54

4 Data analysis and discussion

4.1 Demographics and experiences

The questionnaires were distributed to 300 students out of which 281 students responded and 19 forms were dropped due to unfinished responses. Therefore 262 complete forms (93%) were considered in the data analysis to evaluate the conceptual model. The first part analyzed by IBM SPSS software to explore the demographic characteristics of respondents. Table 4 demonstrates that 71.8% of the students who take part in the survey were males and 28.2% female. The age range of most of the respondents (93%) was under 25. Over 32% of those surveyed were from the second-year bachelor's degree students in university.

The second part of the data analysis is to understand the students' experience level of using mobile devices, the Internet, and their opinion about the utility of application for classroom purposes. Table 5 shows that most of the students (31.7%) have over 6 years of experience in using mobile devices. Most of students (69.8%) owned a smartphone and over 70% of them used mobile data for internet browsing. Among the respondents, 94.3% of students feel comfortable using a computer, laptop, smartphone, tablet or web application and the majority (99.2%) students think that these are useful for the education.

Table 7 Construct reliability and validity

	Cronbach's Alpha (α)	rho_A/Factor Loading	CR	AVE
BI	0.883	0.885	0.920	0.741
EXP	0.815	0.839	0.877	0.642
FC	0.848	0.858	0.897	0.686
PE	0.816	0.821	0.879	0.645
PEOU	0.768	0.784	0.853	0.594
PU	0.882	0.887	0.919	0.739
SE	0.725	0.747	0.829	0.549
SN	0.698	0.722	0.815	0.530
TA	0.739	0.742	0.834	0.558

4.2 Descriptive analysis

Summarizing quantitative information to understand characteristics of entire population or a sample of it in a given situation is called descriptive analysis. It can provide valuable information about the study variables to show their truth (Sekaran & Bougie, 2016). In this section, descriptive statistics were calculated for each construct to understand the characteristics of the sample. The research model includes nine variables namely subjective norm (SN), perceived enjoyment (PE), technology anxiety (TA), experience (EXP), self-efficacy (SE), perceived usefulness (PU), perceived ease of use (PEOU), facilitating condition (FC), and behavioral intention (BI). The result of descriptive analysis is shown in Table 6. The mean is ranged from 3.48 to 4.40 for SE and FC respectively, which indicates that facilitating condition demanded high and self-efficacy required low among the users. Likewise, students have strong BI (4.18) towards using e-learning. The values of standard deviation for all variables ranged from 0.54 (FC) to 0.77 (TA) that indicated the data are normally distributed and concentrated around the mean and less spread.

4.3 Measurement model

The study used convergent and discriminant validity for measuring the proposed model. The purpose of these tests was to investigate the adequacy of the constructs using in the model.

4.3.1 Convergent validity

For evaluating convergent validity, Fornell et al. suggested three measures: composite (construct) reliability (CR), item reliability and average variance extracted (AVE) (Fornell & Larcker, 1981).

A reliability test is the evaluation of the level of consistency among several weights of a variable and this should be done prior assessing its validity (Hair et al., 2018). Cronbach's alpha (α) was used in this study to assess internal consistency

Table 8 Discriminant validity

	BI	EXP	FC	PE	PEOU	PU	SE	SN	TA
BI	0.861								
EXP	0.500	0.801							
FC	0.714	0.521	0.828						
PE	0.622	0.575	0.515	0.803					
PEOU	0.610	0.528	0.512	0.633	0.771				
PU	0.623	0.388	0.457	0.619	0.672	0.860			
SE	0.309	0.511	0.309	0.414	0.505	0.371	0.741		
SN	0.468	0.376	0.431	0.458	0.467	0.410	0.284	0.728	
TA	0.432	0.603	0.379	0.428	0.504	0.366	0.450	0.241	0.747

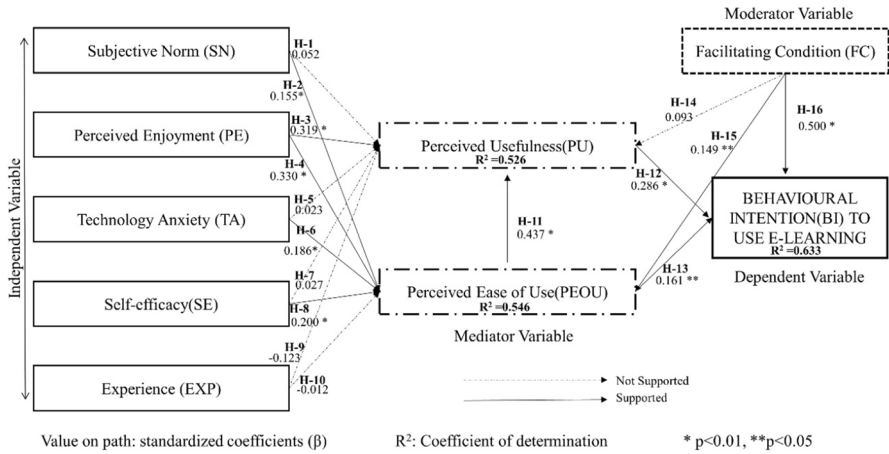


Fig. 2 Structural model

Table 9 Result of hypothesis testing

Hypothesis	Path	Beta	Standard Error	T Statistics	P Values	Decision
H1	SN—> PU	0.052	0.052	0.997	0.160	Not supported
H2	SN—> PEOU	0.155	0.059	2.623	0.004	Supported
H3	PE—> PU	0.319	0.105	3.050	0.001	Supported
H4	PE—> PEOU	0.330	0.084	3.911	0.000	Supported
H5	TA—> PU	0.023	0.065	0.357	0.361	Not supported
H6	TA—> PEOU	0.186	0.062	3.024	0.001	Supported
H7	SE—> PU	0.027	0.089	0.306	0.380	Not supported
H8	SE—> PEOU	0.200	0.067	2.970	0.002	Supported
H9	EXP—> PU	-0.123	0.073	1.675	0.047	Not supported
H10	EXP—> PEOU	-0.012	0.068	0.173	0.431	Not supported
H11	PEOU—> PU	0.437	0.086	5.113	0.000	Supported
H12	PU—> BI	0.286	0.082	3.485	0.000	Supported
H13	PEOU—> BI	0.161	0.072	2.236	0.013	Supported
H14	FC—> PU	0.093	0.059	1.579	0.057	Not supported
H15	FC—> PEOU	0.149	0.070	2.145	0.016	Supported
H16	FC—> BI	0.500	0.079	6.296	0.000	Supported

T-value > 2.58, significance at 1%, T-value > 1.96, significance at 5%

among the constructs that stipulated the construct reliability. There are four score level of alpha: (a) excellent reliability (0.90 and beyond), (b) high reliability (0.70–0.90), (c) moderate reliability (0.50–0.70) and (d) low reliability (0.50 and less) (Hinton et al., 2014). Table 7 shows that all construct’s alpha value ranged from 0.725 to 0.883 exposed high construct reliability except SN which stood in the moderate reliability level.

Factor loading is another statistical method to test the item reliability. Hair et al. recommended that as a general-principle, 0.5 or higher value represents a significant measurement (Hair et al., 2018). As shown in Table 7, all the constructs ranged from 0.72 to 0.88 which demonstrate higher item reliability.

According to Fornell et al. AVE for each construct must be bigger than 0.5 and Table 5 shows that average variation obtained from every single construct met the acceptance level. Therefore, it is proved that this study has satisfactory convergent validity.

4.3.2 Discriminant validity

Discriminant validity is usually tested by squared correlations between two separate weights in either construct and that should be less than the variance shared by the measures of a construct (Fornell & Larcker, 1981). Table 8 represents the result of discriminant validity test. All shared variance between any two separate constructs was less than the amount of variance obtained by either construct. Thus, the constructs of this model submit sufficient discriminant validity.

Table 10 Mediating effects

Mediation effects	STDEV	T Statistics	P Values	Decision
<i>EXP</i> → <i>PEOU</i> → <i>BI</i>	0.012	0.154	0.439	Not significant
<i>FC</i> → <i>PEOU</i> → <i>BI</i>	0.013	1.879	0.030	Significant
<i>PE</i> → <i>PEOU</i> → <i>BI</i>	0.029	1.852	0.032	Significant
<i>SE</i> → <i>PEOU</i> → <i>BI</i>	0.020	1.608	0.054	Not significant
<i>SN</i> → <i>PEOU</i> → <i>BI</i>	0.016	1.554	0.060	Not significant
<i>TA</i> → <i>PEOU</i> → <i>BI</i>	0.020	1.494	0.068	Not significant
<i>EXP</i> → <i>PU</i> → <i>BI</i>	0.021	1.709	0.044	Significant
<i>FC</i> → <i>PU</i> → <i>BI</i>	0.020	1.350	0.089	Not significant
<i>PE</i> → <i>PU</i> → <i>BI</i>	0.049	1.862	0.032	Significant
<i>EXP</i> → <i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.009	0.168	0.433	Not significant
<i>FC</i> → <i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.009	2.139	0.016	Significant
<i>PE</i> → <i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.018	2.292	0.011	Significant
<i>SE</i> → <i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.011	2.283	0.011	Significant
<i>SN</i> → <i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.008	2.342	0.010	Significant
<i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.036	3.485	0.000	Significant
<i>TA</i> → <i>PEOU</i> → <i>PU</i> → <i>BI</i>	0.012	1.895	0.029	Significant
<i>SE</i> → <i>PU</i> → <i>BI</i>	0.025	0.313	0.377	Not significant
<i>SN</i> → <i>PU</i> → <i>BI</i>	0.016	0.928	0.177	Not significant
<i>TA</i> → <i>PU</i> → <i>BI</i>	0.021	0.320	0.374	Not significant

4.4 Statistical analysis and hypothesis testing

4.4.1 Structural model

The study has constructed a structural model for examining the correspondence among the variables. The study has taken two methods for assessing the structural model: a) hypotheses testing, and b) predictive strength checking. For testing the hypotheses standardized path coefficients, the level of significance was utilized. To gauge the predictive strength of the structural model, compute of R^2 or coefficient of determination were brought into play. PLS and Bootstrapping analysis were used in SmartPLS3 software for obtaining the result.

Figure 2 demonstrates that R^2 value for Perceived usefulness (PU) and Perceived ease of use (PEOU) are 0.526 and 0.546 respectively, indicating a moderate effect size to predict the dependent variable. The R^2 value for Behavioral Intention (BI) is 0.633 stipulating a strong level of predictive power in the context of using e-learning system. Additionally, the current structural model suggested that PU and PEOU could mediate the impact of PE on students' behavioral intention in using e-learning system.

4.4.2 Hypotheses testing

Table 9 demonstrates that six hypotheses (H1, H5, H7, H9, H10 and H14) are not supported. Because those hypotheses do not have recommended reference value of P, T, and β . That means the variables-subjective norm, technology anxiety, self-efficacy, experience, and facilitating condition do not have a direct effect on perceived usefulness (PU). In addition, experience does not have a direct impact on the perceived ease of use (PEOU).

In contrast, out of 16, 10 hypotheses (H2, H3, H4, H6, H8, H11, H12, H13, H15 and H16) were qualified and supported. Therefore, subjective norm

Table 11 Moderating effects

<i>FC as a Moderator</i>	STDEV	T Statistics	P Values
<i>Moderating Effect 1: EXP→PU</i>	0.086	1.513	0.065
<i>Moderating Effect 2: PE→PU</i>	0.080	0.331	0.371
<i>Moderating Effect 3: SE→PU</i>	0.085	2.139	0.016
<i>Moderating Effect 4: SN→PU</i>	0.056	0.263	0.396
<i>Moderating Effect 5: TA→PU</i>	0.071	0.383	0.351
<i>Moderating Effect 6: EXP→PEOU</i>	0.085	0.515	0.303
<i>Moderating Effect 7: PE→PEOU</i>	0.067	0.632	0.264
<i>Moderating Effect 8: SE→PEOU</i>	0.066	0.653	0.257
<i>Moderating Effect 9: SN→PEOU</i>	0.058	0.070	0.472
<i>Moderating Effect 10: TA→PEOU</i>	0.070	0.496	0.310
<i>Moderating Effect 11: PU→BI</i>	0.070	0.347	0.364
<i>Moderating Effect 12: PEOU→BI</i>	0.070	0.245	0.403

($\beta=0.155$, $p<0.01$), perceived enjoyment ($\beta=0.330$, $p<0.01$), technology anxiety ($\beta=0.186$, $p<0.01$), self-efficacy ($\beta=0.200$, $p<0.01$), and facilitating condition ($\beta=0.149$, $p<0.05$) have a considerable influence on perceived ease of use (PEOU). Besides, perceived enjoyment ($\beta=0.319$, $p<0.01$) and perceived ease of use ($\beta=0.437$, $p<0.01$) also have a positive influence on perceived usefulness (PU). Both perceived usefulness ($\beta=0.286$, $p<0.01$) and perceived ease of use ($\beta=0.161$, $p<0.05$) have strong effects on the behavioral intention (BI) in e-learning adoption. Most importantly, facilitating condition ($\beta=0.500$, $p<0.01$) have a meaningful connection with the behavioral intention (BI) in the context of e-learning adoption.

4.4.3 Mediating effects

As Table 3 referred to the fact that there are two mediators: PU and PEOU among nine variables used in the proposed research model. Table 10 has been generated using bootstrapping algorithm feature in SmartPLS3 software. The table shows that there are 19 indirect effects. In nine cases, mediating effects were found insignificant in predicting behavioral intentions among university students in the context of e-learning adoption. On the other hand, 10 indirect effects were found positive. In most cases, PU alone does not have the ability to mediate the relationship with behavioral intention except experience and perceived enjoyment. Almost the same situation for PEOU, it mediates for only two predictor variables which are facilitating condition and perceived enjoyment. When two mediators are inline, significant mediating effects were found for most predictors (SN, PE, SE, TA) except EXP variable for anticipating the behavioral intention of students in the context of e-learning environment.

4.4.4 Moderating effects

Facilitating Condition (FC) has experimented as a moderator. A moderator variable can be either qualitative or quantitative which influence the orientation and/or power of the interconnection between an independent/predictor and a dependent/response variable that helps to determine the external validity of relationships between variables (Baron & Kenny, 1986). Moderating strength of FC has examined in a relationship condition of EXP-PU, EXP-PEOU, PE-PU, PE-PEOU, SE-PU, SE-PEOU, TA-PU, TA-PEOU, SN-PU, and SN-PEOU where EXP, PE, SE, TA, SN will act as predictor and PU, PEOU will act as the dependent variable. However, variable types were modified for PU and PEOU for testing the relationship with behavioral intention while PU and PEOU acted as independent/predictor variable. Table 11 has produced from Bootstrapping analysis in SmartPLS3 software. The P-value of the table proved that all the relationship does not have moderating influence except the association between self-efficacy (SE) and perceived usefulness (PU). Therefore, the role of the moderator in this research model was not found worth mentioning.

5 Conclusion

A research model has been proposed and examined in this study for anticipating behavioral intention towards using e-learning system among students at Begum Rokeya University in Bangladesh. The result showed that the sample of the study was representative having proper reflection. The respondents have adequate experience level, and the collected data were normally distributed. The study found that the proposed research model as internally consistent and reliable. The structural model of this study identified sufficient predictive strength. More than 60% of the hypothesis were found significant. Considerable mediating effects were found for most of the predictors. However, the role of moderator in this research model found trivial. It is the authors expectations that the results of this study would play a significant role for the higher education institutions in Bangladesh for making their e-learning strategy.

6 Impediments and further study

There are some impediments found in this study that remained unresolved here. For instance, the genre of this study was observational, consequently, timespan between respondents to response and researchers to assess the outcome was very short and specified. But this study sheds light on some issues that may be considered important for future research to address the deficiencies.

Firstly, the technology and knowledge have been evolving extremely fast. As a result, student's perception may change over the time. Therefore, future studies may need to modify the existing approach for acquiring more precise outcome. Secondly, due to the time constraint, the study focused on a specific university, but in future, the study should be expanded to other universities altogether as well.

Thirdly, the study result showed that most of the variable should have directly or indirectly influenced the relationship with behavioral intention. Thus, in future studies, variables should be repositioned and should act as any role- independent, mediator, moderator and dependent.

Finally, the study used an online questionnaire during the pandemic situation. Thus, they might be twisted in expressing their neutral opinion that may cause a flaw in the result. In future studies, these issues will be more carefully addressed.

Appendix

Questionnaire

Section-1: Demographic

No	Question
1	Please select your gender A. Male B. Female
2	Please select your age category A. < =25 B. 26–35 C. 36–45 D. 46–55 E. > 55
3	Please select your years of study A. 1st Year (Bachelor) B. 2nd Year (Bachelor) C. 3rd Year (Bachelor) D. 4th Year (Bachelor) E. Masters F. MPhil G. PhD

Section-2: Experience on Using Internet, Smartphone & Computer

No	Question
4	Select experience level in using mobile devices A. < 1 B. 1–3 C. 3–6 D. > 6
5	Select the ICT device you own A. Computer/Laptop B. Smart Phone C. Tablet D. None
6	Select the type of Internet connection you use for communication A. Mobile data B. Broadband C. None
7	Are you comfortable using computer, laptop, smartphone, tablet or web applications? A. Yes B. No
8	Do you think computer, laptop, smartphone, tablet or web applications can be useful for education purposes? A. Yes B. No

Section-3: Assessment Questions

No	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Subjective norm (SN)						
9	SN1. Individuals who influence my behaviour would think that I should use e-learning	1	2	3	4	5
10	SN2. Individuals who are vital to me would think that I should use e-learning	1	2	3	4	5
11	SN3: I will use the e-learning system according to the opinions of the people I value	1	2	3	4	5
12	SN4: I will use the e-learning system if my family accept it	1	2	3	4	5
Experience (EXP)						
13	EXP1: I love to use computer/laptop/tablet/smartphone	1	2	3	4	5
14	EXP2: I am comfortable using the internet	1	2	3	4	5
15	EXP3: I am comfortable using different mobile-apps and web-applications	1	2	3	4	5
16	EXP4: I am very familiar with the basic functions of computer/laptop/tablet/smartphone	1	2	3	4	5
Perceived Enjoyment (ENJOY)						
17	PE1: I feel enjoy when use e-learning	1	2	3	4	5
18	PE2: The process of using e-learning is enjoyable to me	1	2	3	4	5
19	PE3: Using e-learning is entertaining	1	2	3	4	5
20	PE4: I enjoyed myself to join the class virtually from my own pace	1	2	3	4	5
Technology Anxiety (TA)						
21	TA1: I am not afraid of using a computer/laptop/tablet/smartphone	1	2	3	4	5
22	TA2: Computers make me feel uncomfortable	1	2	3	4	5
23	TA3: Working with smart devices makes me nervous	1	2	3	4	5
24	TA4: I am feeling stress using new technologies	1	2	3	4	5
Self-efficacy (SE)						
25	SE1. I am confident in using the e-learning without the help of others	1	2	3	4	5
26	SE2. I am confident of using the e-learning even if I have never used such a system before	1	2	3	4	5
27	SE3: I am confident of using the e-learning even if I have only the software/application manuals for reference	1	2	3	4	5

Section-3: Assessment Questions

No	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
28	SE4: No additional knowledge is required for using the e-learning system	1	2	3	4	5
Perceived Usefulness (PU)						
29	PU1: Using the e-learning would help me to achieve learning-tasks more quickly	1	2	3	4	5
30	PU2: Using the e-learning would increase my learning performance	1	2	3	4	5
31	PU3: Using the e-learning would improve the usefulness of learning in my point of view	1	2	3	4	5
32	PU4: Using e-learning would make my academic life more convenient	1	2	3	4	5
Perceive Ease of Use (PEOU)						
33	PEOU1: Learning to use the e-learning system would be easy for me	1	2	3	4	5
34	PEOU2: I would find it easy to use the e-learning to do my tasks	1	2	3	4	5
35	PEOU3: My interaction with the e-learning would be clear and understandable	1	2	3	4	5
36	PEOU4: I find e-learning system require a less of physical effort	1	2	3	4	5
Behavioural Intention (BI)						
37	BI1: If I had access to the e-learning, I intend to use it	1	2	3	4	5
38	BI2: I plan to use the e-learning in the future	1	2	3	4	5
39	BI3: I intend to use the e-learning system frequently	1	2	3	4	5
40	BI4: I recommend another student to use the e-learning system	1	2	3	4	5
Facilitating Condition (FC):						
41	FC1: If the e-learning infrastructure is ensured at university, I intended to use this system	1	2	3	4	5
42	FC2: If the resources are accessible from anywhere, I would love to use the e-learning system	1	2	3	4	5
43	FC3: If the Wi-Fi internet is distributed the whole campus, I intend to use the e-learning system	1	2	3	4	5
44	FC4: The affordable price of smartphone and Internet will encourage me to adopt e-learning system	1	2	3	4	5

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