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Using a Modified Technology Acceptance Model for a Learning Management System Platform: A Questionnaire Design for Evaluating the Blackboard Learning Management System

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Abstract

Educational approaches have advanced and changed tremendously in recent years. The evolution of communication technologies has been important, particularly since many educational activities have been moved to an e-learning format. This has introduced innovative teaching methods and educational management techniques. Learning management systems (LMS) such as Web-based course development tools (WebCT), Blackboard, and learning spaces are currently widely accessible. Most higher education institutions use Blackboard as their primary LMS platform, making it one of the most frequently used LMS platforms. Blackboard technology is a widely used online program for educational institutions that makes it easier to distribute crucial items from teachers to students, such as papers, student reports, projects, and other publications. Consequently, the main objective of this paper is to design a technology acceptance model to investigate user acceptance of a Blackboard learning management system. In addition, we aim to create a quantitative strategy using a technology acceptance model (TAM) questionnaire as the major investigation tool. The Blackboard learning management system is evaluated using a quantitative approach based on the TAM. We use perceived usefulness, perceived ease of use, user satisfaction and attributes of usability as the associated constructs for evaluation. All of these structures were altered to fit the study's needs. Furthermore, in this paper, we examin the specifics of each concept, and how they relate to the research problem. The study's findings indicate a set of methodologies that can be used to evaluate the benefits of using the Blackboard system for online learning.

Keywords: Tam, model, education, students, lecturer, university, learning tool

1. Introduction

Technology is widely employed in all aspects of life, including education. The spread of information and communication technologies has had widespread effects on people’s lives. However, for a long time, the extent to which those technologies have been embraced by students and teachers has been poorly understood (Abu-Dalbouh and Alateyah, 2021). It has been challenging to determine the fundamental rational for technology acceptance. The decision on technological adoption influences crucial concepts, such as users' views, attitudes, satisfaction, change adaption and culture (Abu-Dalbouh, 2016a). There is a substantial body of work on the use of the TAM in the acceptance of educational technology, such as collaboration tools, cellular phones, media, and e-learning. The TAM is an explanatory model that has provided insight into why users accept or reject technology. Among schools and academicians, this is one of the most effective measurements for effective computer use (Abu-Dalbouh, 2013).

It is now vital to use technology in education for instructional reasons; some recent researches have addressed this (Abu-Dalbouh & Alateyah, 2021; Mailizar et al., 2020; Kerres, 2020; Wang et al., 2020). The Blackboard learning system is a media incorporation of instructions that uses a centralized platform to manage communication processes during instructional activities. Edmodo, social media, blogs, Coursera, and other HEI-developed innovative technology tools are being used to convert e-learning from computer-managed to collaborative online learning. If students employ e-learning, they should anticipate making considerable progress in their learning activities (Omar, Kalulu & Alijani, 2011; Smith, Samors & Mayadas, 2008). The rise of e-learning is frequently attributed to its low costs and supportive infrastructure, which promotes instructional

effectiveness (Clark and Mayer; 2016). E-learning integration in typical circumstances makes learning more flexible, efficient, and effective. Several studies have been conducted to look into the use of e-learning (Abu-Dalbouh, 2021; Megahed & Mohammed, 2020; Shi et al., 2020; Pham et al., 2019; Ram ́ez-Correa et al., 2015; Kasraie & Kasraie, 2010). Some recent studies on educational e-learning solutions were also discussed in (Abbasi, 2020; Almanthari, Maulina & Bruce; 2020; Favale et al., 2020; Radha, 2020). Nonetheless, research on e-learning adoption in impoverished nations and specialized topic areas is relatively sparse. As a result, this research was carried out to develop a technology acceptability model for the use of e-learning. To examine the links between factors, the study used the TAM as a model for academics.

To investigate user acceptance of the Blackboard learning management system, we create a technology acceptance model. We design, develop and eventually validate the usage of the Blackboard learning management system as an online learning tool. Procedures, approaches, methods and techniques used to capture and gather all essential information for the study topic are referred to as the research methodology.

The methodology encompasses the tools and techniques used to carry out the research on a specific issue. Phases, tasks, methods, techniques, tools and outcomes are all part of this problem-solving paradigm. Samples, fieldwork, monitoring of the research environment, assessments, talks, modeling and joint necessary planning are all methods that can be used to gather data from various sources. These procedures can be used to validate and refine the proposed hypothesis, and are arranged in the study's framework (Abu-Dalbouh, at al., 2017; Abu-Dalbouh, 2016a; Abu-Dalbouh, 2016b; Abu-Dalbouh, 2016c).

As a result, this paper is organized in such a way to reveal the expected investigation technique that may be applied to solve the anticipated analysis challenge. There are two primary categories of analysis: quantitative and qualitative. It is worth noting that quantitative analysis is linked to the positivist perspective, whereas qualitative analysis is linked to the informative perspective (Creswell, 2011). Qualitative and quantitative data, on the other hand, should not be seen in the same way as instructional and positivist perspectives. Additionally, the potential for qualitative and quantitative analysis to be informative, positivist, or significant is still being considered. The purpose of qualitative analysis is to uncover the mechanisms through which people generate meanings about their worlds, as well as to report on those meanings. Qualitative analysis is a type of analysis that produces results that cannot be obtained through the use of processes involving applied mathematics or other methods of quantification and is used to uncover the processes through which people generate meanings about their environment and to report on those meanings. Qualitative analysis is a research approach for describing social development through the construction, comparison, duplication, categorization and classification of the study's object. To put it another way, qualitative research looks at things through the lens of words, rather than figures (i.e., knowledge that cannot be quantified). Quantitative analysis is based on the creation of metrics (numbers) to explain the phenomena being studied. It is a deductive method that involves determining and evaluating the relationship between variables. This method clarifies the number of people who respond in a certain way, but it does not provide a solution to the question of "why." The TAM starts by presenting external variables as the foundation for tracing the impact of external factors on two key internal beliefs: perceived usefulness and perceived ease of use, with perceived ease of use in addition to external variables impacting perceived usefulness. Both of these beliefs influence how a user feels about using an information system. Moreover, it influences behavior intention to use IS which is the most important factor in determining the actual conditions of system use (Abu-Dalbouh, 2013).

2. Purpose of the Study

A learning management system (LMS) is a software application that keeps track of all aspects of the educational process (Abu-Dalbouh & Alateyah, 2021). While the term "learning management system" is the most common, it can also be referred to as a "training management system," "learning activity management system," or even "learning experience platform". An instructor can use a learning management system to create and present content, track student interactions, and evaluate student achievement. A learning management system may allow students to use features and functionality, such as text chats, video conferencing and discussion forums.

Blackboard is the most often used LMS platform, serving as the platform of choice for the majority of higher education institutions. Therefore, this study aims to design a technology acceptance model to investigate the acceptability of Blackboard as a tool of learning. In addition, based on the technology acceptance model, we intend to investigate the perspectives of higher education students regarding the learning environment when adopting the Blackboard system. Further, we design a quantitative plan using a TAM questionnaire as the primary research tool. The Blackboard learning management system is designed using a quantitative technique based on the TAM. The dimensions are perceived usefulness, perceived ease of use, user satisfaction and

usability attributes. All of these dimensions were modified to satisfy the needs of the study.

3. Materials and Method

The study's views will influence the use of a qualitative or quantitative approach (Abu-Dalbouh, 2013; Kanaan, 2009). We use a quantitative technique and form to meet this study's goals. According to (Abu-Dalbouh, 2013), a quantitative approach gives a better understanding of population trends and connections between variables. A quantitative study is less expensive and takes less time to perform than a qualitative study, since it enables the researchers to collect data from a large sample of the population. As a result, the current study uses a form style and measurement to explore the components in the adoption model and analyse the use of the Blackboard system. In addition, a Likert scale (Abu-Dalbouh, 2013; Chomeya, 2010) is used for each set of items.

The 5-point Likert-scale ((1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, and (5) Strongly Agree) is used to estimate how strongly participants agree or disagree with the items on a questionnaire (Chomeya, 2010). The proposed method for this investigation is developed in five phases. Each phase provides method step(s) and output for a deeper comprehension of the most important objectives and what to do in every phase, as mentioned in the next section (Abu-Dalbouh, 2013).

Sampling technique: A technique which relies on a small selection of units from the population to draw conclusions about the whole (Jemain, Al-Omari & Ibrahim, 2007). A sample is a smaller group composed of people randomly chosen from the rest of the population (Al-Omari, Jaber & Al-Omari, 2008). From this, researchers must consider how to draw conclusions and reveal patterns about the whole population under study.

Analysis Techniques: There are major goals of knowledge analysis that are collecting a description of the sample understanding and its characteristics, validating the goodness of understanding and providing evidenced hypotheses.

Variable Measurement: The study's methodology is based on the use of questionnaires. A questionnaire method is used to evaluate the Blackboard application. The form is divided into four sections: perceived usefulness, perceived ease of use, user satisfaction and attributes of usability. These parts included a series of items aimed at determining the degree of acceptance for use of the Blackboard application in learning.

4. Proposed Methodology

This is based on a combination of current research and the author's personal experiences as a Blackboard learning system evaluator. The phases of the planned analytical technique are depicted in Figure 1. The phases are not in any particular order. Switching from one phase to the next is a common occurrence. The specific output of a section must be executed next, depending on the results of each phase (Abu-Dalbouh, 2013).

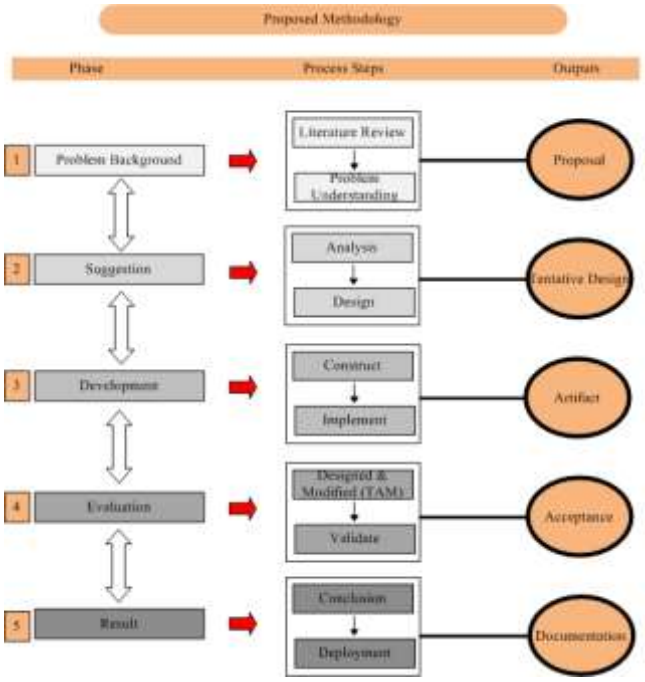

Figure 1. Proposed Methodology (Abu-Dalbouh, 2013)

Problem Background: Developing knowledge of the study's purpose and scope, as well as the issues that must examine, is the first phase of this process. Data collection, as well as some understanding of the topic, are obtained through discussion and associated literature reviews. According to the data acquired, Blackboard is a key and widely used LMS platform. For educational establishments, Blackboard technology is a frequently used Internet tool. This phase's output is a proposal.

Suggestion: Many methods are investigated to find the best approach for completing this work. These are discussed in-depth. As a result, this study used the TAM for an evaluation of the adoption of the Blackboard application in learning systems. This phase's output is a tentative style.

Development: In this phase, the questionnaire design is proposed. Implementation strategies will differ based on the item to be built. The implementation itself can be extremely simple, and it does not have to be innovative beyond the current state of the item; the innovation is mostly in the design, not the construction. The elements in this study were built using a step-by-step architectural technique. We are aimed to show the main structure of the dimensions in this phase. This phase's output is an artifact.

Evaluation: The purpose of the evaluation is to determine the accuracy of the items and measurements. In the first phase, evaluation was undertaken using criteria that are always implicit, but usually made explicit. Discrepancies were clarified. The explanatory hypotheses, which are often rather wide, are rarely abandoned; rather, they are adjusted to fit the new data. Evaluation happens all the time in a design process, because every design detail decision involves a vast number of "micro-evaluations". Following each decision, the designer carries out a "thought experiment" in which he or she mentally exercises that aspect of the design. According to this concept, the user acceptance model's usefulness is limited. Various operational contexts will be modeled and "hand-stepped" through the execution rules to ensure that logically right behavior occurs in appropriate periods in order to test the conceptual design. The major goal of this phase was to evaluate the stability and usability of the Blackboard learning system as a tool in a virtual classroom. Users such as students and lecturers evaluated it. The result of this phase is to accept the Blackboard learning system.

Result: This is the final phase, in which the final dimensions are related to the design. Functionality testing and report writing are part of this study. Documentation is also underway. The study's findings are based on the study's objectives and the users' evaluations of the Blackboard learning application. Questionnaires are used to assess the satisfaction and usability values of the users. The final phase's result is certification.

5. Technology Acceptance Model

Several theoretical techniques have been developed to better explain how end users make decisions about how to use technological applications. Theories can be used to determine whether or not present IT applications will be successful (Venkatesh et al., 2003; Rogers, 1995; Fishbein and Ajzen, 1975). According (Davis, 1989; Davis, Bagozzi & Warshaw, 1989), the TAM is one of the most extensively used concepts in IT analysis. It is unquestionably a widely used paradigm to assess the acceptance of new technology adoption and use. The angle paradigm, developed by (Fishbein & Ajzen, 1975), differentiates concepts from attitudes and outlines how environmental stimuli are logically connected to views, attitudes, and conduct.

The cap is based on a theoretical paradigm known as the Theory of Reasoned Action (TRA). This is a broad approach that examines how people appear to act. According to the TRA, a person's performance is influenced by his or her perspective and subjective norms regarding the action in question. Furthermore, a person's current behavior is linked to their values and motivations. Features in the TAM determine the perceived usefulness and ease of use of any technology, as well as user acceptability. The degree to which a person believes that using a specific system will improve work performance is referred to as perceived usefulness. The degree to which a person believes that utilizing a certain system involves no physical or mental effort is referred to as perceived ease of use (Davis, 1989; Davis, Bagozzi & Warshaw, 1989).

According to the TAM, the most crucial factor in determining one's willingness to accept technology is one's mindset, or individuals' intentions to use technology. This specifies how the program will be used, and technology attitudes influence intentions (Davis & Venkatesh, 2004; Davis, 1989; Davis, Bagozzi & Warshaw, 1989). External factors like educational achievement and gender, and organizational elements like computer training, can all have an impact. Perceived utility and ease of use (Burton-Jones & Hubona, 2005; Venkatesh & Morris, 2000; Venkatesh, 1999) are examples of such variables. TAM theory is frequently employed in a range of technological and analytical applications (Raitoharju, 2007; Lee et al., 2006; Chau & Hu, 2001). It is used to develop explanations for the factors that influence technology acceptability that may be applied to a wide range of user groups and technical types. The Technology Acceptance Model's validity has been proven in a number of contexts and analysis

frameworks, including healthcare (King & He, 2006; Ma & Liu, 2004; Chau & Hu, 2002a; Chau & Hu, 2002b). The TAM was used in this study to help comprehend the acceptance the Blackboard learning system in education, as well as to achieve the study's objectives and structure the research process. External variables included individual traits such as gender and age.

The TAM is divided into four dimensions: perceived ease of use, usefulness, usability attributes, and user satisfaction. The goal of the study was to consider these dimensions in order to determine user satisfaction with the Blackboard learning system. This is thought to be tied to the adoption of a technology, in this case a Blackboard learning system. The TAM is one of the most extensively used models for describing data system usage. A large number of investigations have been conducted that have specific relevance to the basic model's improvements. Many models have been proposed based on the TAM model, such as the incorporated TAM and the theory of planned behavior, which have suggested new variables that can be added to the original TAM (Venkatesh & David, 2000; Taylor and Todd, 1995).

Several authors have improved the TAM by adding additional components to the traditional TAM dimensions. The acceptability of the World Wide Web was given a new variable, called playfulness (Chau, 1996). In (Van der Heijden, 2000), a distinction was made between perceived long-term and near-term utility by introducing two new factors into TAM in a study that looked at internet usage and individual acceptance. Furthermore, (Abu-Dalbouh et al ., 2015) updated the technology acceptance model with the purpose of analyzing academic performance at Unaizah-Qassim University's College of Sciences and Arts. TAM was combined with peer influence as a factor, and the link between behavioral intention and perceived usefulness was found to be significant between many target users. The authors of (Chau and Hu, 2001) compared many versions of TAM models with the original TAM in a targeted healthcare professional situation in Hong Kong. According to the data, the TAM performed best in describing physicians' intentions to use telemedicine technology. The authors of (Shih, 2004) integrated the TAM with a conceptual framework that considered the data's relevance. To further understand internet banking usage, (Lee, 2009) coupled the TAM with the theory of planned behavior, perceived risk, and perceived reward. The TAM has been used by researchers world wide for better understanding how different types of information systems are adopted. The TAM was used by (Shafeek, 2011) to assess the acceptance of e-learning systems by teachers. It has been used to study online purchase behavior. The authors of (Zhou, Dai & Zhang, 2007) established the acceptance model for online shopping, which is based on the TAM. Trust and perceived risk were added as new variables to predict e-commerce acceptance. In a model established by (Pikkarainen et al., 2004) to analyze the adoption of online banking in Finland, information on online banking and perceived utility were found to play a critical role. The acceptance pattern and role of internet self-efficacy plays a vital part in e-service adoption. To better understand mobile service uptake, (Ervasti and Helaakoski, 2010), constructed a model based on the TAM and TPB, finding that perceived utility is the most important element. To better understand the adoption of Radio Frequency Identification, combined the TAM with security issues (Muller-Seitz et al., 2009). The authors of (Abu-Dalbouh, 2013) created a TAM to assess user acceptance of a handheld device in the healthcare field, by altering the features of the Technology Acceptability Model. The authors of (Abu-Dalbouh, 2016b) created a new evaluation model for evaluating user acceptability of software and system technologies, by integrating the expert user in acceptance of new technology.

6. Discussions

Learning Management Systems (LMSs) are software applications used in the field of education. They aspire to create educational technologies that mix a variety of components to provide excellent enriched learning media (Abu-Dalbouh, 2021). They provide a simple platform for creating and spreading educational resources, as well as fostering user participation and discussion. An LMS is frequently used as a source of learning resources since it gives a uniform interface to several participants, such as students, instructors, writers, and managers. By allowing advanced interactions between instructors and learners, as well as rapid access to learning resources, an LMS provides flexibility in terms of space and time. Moreover, it serves as a single point of contact for students, instructors and managers for all types and degrees of interactions. Learning management systems (LMSs) have been used by a certain number of universities to enhance their existing resources and facilitate distance learning. Universities typically employ LMS to manage their teaching and learning resources. The effectiveness of LMSs in the institutional setting is heavily reliant on faculty acceptance of the tool, as faculty have a considerable impact on students' LMS use (Al-Busaidi & Al-Shihi, 2010).

Usability is divided into four categories by the standard software: Usefulness, perceived ease of use, user satisfaction, and attributes of usability. The purpose of this study was to construct all of these categories, in order to assess user acceptance of the eight queen puzzle game system. According to the TAM, these diminutions are

all linked to the acceptance of the technology system (Abu-Dalbouh, Almansour & Aldowighri, 2021). The puzzle game received high marks for user satisfaction. The influence of four different types of satisfaction on overall player satisfaction was studied, measuring perceived usefulness satisfaction. The proposed mobile tracking system was found to be successful (Abu-Dalbouh, 2019). The degree to which a student believes that adopting a Blackboard learning system will improve the learning process is important. As indicated in Table 1, the measurement of perceived usefulness consisted of 15 items that were changed to fit the setting of this study.

Table 1. Perceived of Usefulness items

Construct	Operational definitions	Measured items
Perceived of usefulness	Perceived usefulness is the impression that the blackboard learning management system is used to assess a specific age student's intelligence, learning outcome, and manner of reasoning. In addition, improved my course performance, inspiring me, helpful tool for learning and enhanced my effectiveness in learning.	PU1: Blackboard learning management system enhances creativity. PU2: Blackboard learning management system involves problem solving techniques. PU3: Blackboard learning management system will improve decision-making and thinking strategies. PU4: Blackboard learning management system allows students to test their consistency, skills and strategy. PU5: Blackboard learning management system is added more enjoyment and excitement. PU6: The blackboard learning management system will help students by using all features while learning. PU7: Blackboard learning management system will save time, effort and money. PU8: Recording lectures for students in blackboard collaborate is improved my understanding lectures. PU9: By using blackboard learning system is Keeping Track of the latest developments in the course. PU10: By using blackboard learning system calendars, I was able to do better planning of my class activities. PU11: By using blackboard learning system is Helped in planning the course activities. PU12: Support for blackboard was available when I needed it for my coursework. PU13: Blackboard helped me to communicate and collaborate with my classmates. PU14: I feel that blackboard is an effective educational tool. PU15: Blackboard learning system will enable the teacher to get the information of the students quickly.

Perceived ease of use: How much a person believes that using and building a Blackboard learning tool will save time and effort, and increase learning performance? As indicated in Table 2, the measurement of perceived ease of use included 10 items that were adjusted to the context of this study.

Table 2. Perceived Ease of Use

Construct	Operational definitions	Measured items
Perceived Ease of use	Perceived ease of use refers to a level of easiness that students and lecturers feel when using blackboard learning system.	EU1: Learning to operate blackboard learning system would be ease for me. EU2: I would find it easy get blackboard learning system to do what I want it to do. EU3: My interaction with blackboard learning system would be clear and understandable. EU4: I would find blackboard learning system to be flexible to interact with. EU5: It would be easy for me to become skillful at using blackboard learning system. EU6: Sharing of information via blackboard learning system is simple and flexible. EU7: blackboard learning system are used on line with ease to access educational materials. EU8: The blackboard learning system greatly enhances my scholarly research collaborations. EU9: Carrying out tasks on the blackboard learning system is easy and interesting. EU10: Use of blackboard learning system enhances attend classes with less stress.

User satisfaction: It is difficult to feel satisfied when dealing with a system that is connected to the Internet of Things. This is a highly subjective evaluation that is hampered by user expectations. The user satisfaction construct was measured using 10 items that were adapted to fit the setting of this study, as shown in Table 3.

Attributes of usability: A Blackboard-based learning system is a world of Human-Computer Interactions (HCIs). Its goal is to bridge the gap between human and system aims. This can be achieved by including human factors in the design of an interactive blackboard learning system, and establishing realistic tools for observing human behavior and performance. The measurement of the attributes of usability construct included 10 items that were customized to the context of this study, as shown in Table 4.

Table 3. User Satisfaction Items

Construct	Operational definitions	Measured items
User satisfaction	User satisfaction refers to a level of satisfying that students and lecturers of using blackboard learning management system.	US1: I completely satisfied in using the blackboard learning system. US2: I feel very confident in using the blackboard learning system. US3: I found it easy to ask questions in chat screen while attending the class. US4: I can accomplish the task quickly using this procedure. US5: I believe that from using blackboard learning system will add more enjoyment and excitement. US6: I found it easy to find assignment in blackboard learning system. US7: I found it easy to find Recording lectures in blackboard learning system. US8: I found it easy to share notes and presentation in blackboard learning system. US9: I found the blackboard learning system meet my needs. US10: I found it easy to send request to the support system in blackboard.

Table 4. Attribute of Usability Items

Construct	Operational definitions	Measured items
Attribute of usability	Attribute of usability shows up potential issues in the blackboard learning management system. The usability helps to get feedback on what is or is not working and have a much broader understanding of what students and lecturers are doing and how they interact with the blackboard learning management system.	AU1: It easy to interact with blackboard learning system. AU2: The procedure through blackboard learning system is clear. AU3: I found it easy to check my marks in blackboard learning system. AU4: I found the various functions in this system were well integrated. AU5: I think that I would like to use this blackboard learning system always. AU6: I found the blackboard learning system provides the features I need. AU7: I think that I would like to use the blackboard learning system frequently. AU8: The blackboard learning system gives error messages that clearly tell me how to fix the problems. AU9: It is easy to find the information I need. AU10: The system's capabilities meet my requirements.

7. Conclusion and Future work

Distance learning, often known as e-learning, online learning, or distance education, refers to the presence of teachers and students outside of the classroom. It entails the use of a variety of technical tools to help students and teachers communicate more effectively during the learning process. The advancement of technology and the internet has aided the advancement of distant learning. Blackboard is the most extensively used learning management system among U.S. postsecondary institutions, and is one of the main commercial LMS (or CMS) programs used in North America, Europe and the Middle East. Blackboard offers a password-protected environment, as well as administration tools, to make online education more convenient. The TAM has been frequently used to investigate e-learning. These studies showed that e-learning is being used in a variety of countries around the world. As a result, the current research contributes to the academic literature by elucidating the state of distant learning and exploring how to construct questions to assess learning system tools.

This paper introduced a framework for validating the Blackboard system using the Technology Acceptance Model. We proposed a methodology based on literature studies to evaluate and investigate usability tests for perceived usefulness, perceived ease of use, user satisfaction, and usability attributes, considered important for user evaluation of the Blackboard system to determine if this tool will be of use to the intended users. It is critical to get the most out of an e-learning budget, and to achieve this it is necessary to conduct an assessment of the elements that influence the adoption of e-learning technologies. Designing a technology acceptance model for the Blackboard learning system was simply a first step. Looking ahead, it will be important to evaluate the Blackboard learning system from the perspectives of students and instructors, using this questionnaire design.

The study model provides a valuable framework for researchers and university administrators who need to measure students' readability of online learning, and evaluate the learning management tools of online learning. This questionnaire design should also be used by lecturers and students.

Universities can use the design of this study to help them evaluate LMS applications and boost student acceptance and satisfaction. Students' motivation to continue their blended learning education could be hampered by a non-acceptance and unsatisfactory experiences. In order to construct a successful LMS environment, the critical elements outlined in this study must be considered.

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