Modeling teachers acceptance of learning management system in higher education during COVID-19 pandemic: A developing country perspective

Idrees Waris1 | Irfan Hameed2

1Department of Management Sciences, University of Turbat, Turbat, Pakistan
2College of Business Management, Institute of Business Management, Karachi, Pakistan

Correspondence
Irfan Hameed, College of Business Management, Institute of Business Management, Karachi 75190, Pakistan.
Email: irfanhameed.iu@gmail.com

The ubiquity of the World Wide Web has provided massive opportunities to teachers and learners around the globe to share knowledge anytime anywhere via learning management system. Hence, considering the needs of the students; universities have arranged the facilities of the learning management system. This study is an empirical evaluation of university faculty members' intention to use a learning management system. We extended Davis's (1989) Technology Acceptance Model (TAM) to evaluate faculty members' intention to use learning management system amid COVID-19. Data were obtained from the faculty members of Pakistani universities through the convenience sampling technique and analyzed using PLS-SEM. The outcomes of the study revealed that perceived ease of using a learning management system, user-interface design, and faculty members' innovativeness have a favorable impact on their intention to use learning management system. Facilitating conditions positively influenced intention to use learning management system. However, the positive relationship between facilitating conditions and perceived ease of using the learning management system was insignificant. The results indicate that the extended TAM model has effectively predicted faculty members' intention to use the learning management system. The findings of the current study can be used for the training and development of faculty members by institutions and regulatory bodies in developing countries.

KEYWORDS
facilitating conditions, innovativeness, intention to adopt, perceived ease of use, perceived usefulness, user-interface design

1 INTRODUCTION

The traditional way of learning has been replaced by the use of the internet. The usage of the internet is increasing rapidly and now people can connect more conveniently by using various platforms. This is evident with the fact that more than 45% (3.5 billion) population of the world is the user of one or the other social media forum alone (Hameed & Irfan, 2021). Through the availability of educational content on the internet people from various walks of life can interact to achieve a common objective (Liu et al., 2010). Online courses have got broader opportunities for development with the advent of online education (Kaufmann & Buckner, 2019). The importance of online learning has been highlighted by various authors around the world (Harrison et al., 2018). Effective online teaching is heavily dependent on the skills of the teacher teaching the course. The time management skills of the faculty can be enhanced by providing training to the faculty members (Oyarzun et al., 2020). Among other essentials of online teaching are technological competencies and instructional design. These can also be developed with the help of tailored-made training programs (Dunn & Rice, 2019; Roberts, 2018). Comprehending the...
essentials and features of the learners can provide valuable insights in designing fruitful training programs (Al-Mamary, 2020; Dede, 1996; Murphy & Pinnegar, 2018).

The role of technology-based teaching is even more important in times of global turmoil due to the COVID-19 upsurge (Shah et al., 2021; Teräs et al., 2020). The COVID-19 pandemic first emerged at the end of 2019, in the Wuhan province of China, and World Health Organization (WHO) has declared it a deadly disease (Raza et al., 2020). The highly contagious COVID-19 virus has infected millions of people and created chaos due to its high death rates (Ahorsu et al., 2020). To avoid further destruction due to the COVID-19 virus, different countries of the world have imposed state policies of social distancing, isolation, mask-wearing, hand sanitization, and self-quarantine (Anderson et al., 2020; Tandon, 2020). As a result, educational institutions have also implemented a full-fledged lockdown and physical activities were suspended (Kalloo et al., 2020). To compensate for the educational loss of the students, numerous institutions have adopted technology-based learning systems such as learning management system (LMS) (Raza et al., 2020).

LMS as a web-based technology was employed to continue academic learning by proper planning, implementation, and assessment of institutions’ curriculum activities (Alias & Zainuddin, 2005). LMS helps students to get access to education and promotes a knowledge-sharing culture (Fathema et al., 2015). The use of LMS provides an uninterrupted support system and encourages students to participate in curriculum activities (Waheed et al., 2016). It also provides teachers an opportunity to communicate with the students and share course materials and resources (Waris et al., 2021). The effectiveness of technology-based learning systems cannot be ignored in times of global crises like COVID-19, as it helps to continue educational activities (Rachmadtullah et al., 2020; Shah et al., 2021). The acceptance of LMS higher education fluctuates from one country to another country (Zwain, 2019). In the context of higher education in Pakistan, the majority of the universities follow the traditional method where faculty members rarely use LMS technology as a medium of education (Raza et al., 2020). The study of Jaschik et al. (2014) on faculty intention to use technology as a medium of instruction revealed that merely 20% of the faculty members use technology to record lectures. In addition to this, researchers have not paid much attention to faculty innovativeness in the adoption of technology. This indicates a gap to understand the factors that help faculty members’ intention to use LMS.

This paper aims to explore the internal and external factors that affect faculty’s intention to use a learning management system (LMS). In the context of using LMS technology, the internal factor of an individual’s innovativeness has an important role to play as it refers to seeking novelty and willingness to try new technology (Agarwal & Prasad, 1998). The external factors such as user-interface design and facilitating conditions are important in the context of technology adoption as these factors improve and facilitate the use of technology (Metros & Hedberg, 2002; Teo, 2010). Several studies have extended technology-based models such as the UTAUT model and TAM to assess intention to use LMS (Fathema et al., 2015; Raza et al., 2021). In the context of the current study, TAM is the most appropriate model to evaluate faculty intention to use LMS. Past studies have applied TAM and assessed individual intention to use technology for learning purposes (Lee et al., 2005; Ngai et al., 2007; Ong et al., 2004; Pituch & Lee, 2006). Therefore, this study intends to extend the TAM model by incorporating the following additional constructs: innovativeness, facilitating conditions, and user-interface design to evaluate faculty intention to use LMS during COVID-19.

The first section of this study discussed the importance of online teaching and learning in the contemporary world. The second section presented the theoretical framework adopted in this study and the literature of the constructs. In the third section, the methodology adopted in this study was explained. The Fourth section elaborated the findings of the study. Finally, we discussed the conclusion and discussions, policy implications, limitations and future research directions.

2 THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

2.1 Theoretical framework: An extended technology acceptance model

The importance of the theoretical models for predicting their acceptance can be understood by the fact that the various studies are focused on this particular aspect. One out of the several models addressing this phenomenon is the technology acceptance model (TAM). TAM has been developed by Davis (1989) to estimate people’s adoption of technology (Park et al., 2018). The purpose of the introduction of TAM was to identify the intention to use and adopt the new technology. Perceived ease of use and usefulness can be explained better in terms of information management systems with the help of TAM (Davis, 1989). TAM 2 was proposed by adding image, job relevance, subjective norms, experience, and voluntariness into the model by Venkatesh and Davis (2000). Afterward, the experience was incorporated into the model as a moderator in TAM 3 by Venkatesh and Bala (2008). Since then TAM 3 also grabbed researchers’ attention along with TAM 1 and TAM 2. In this study extended model of TAM has been used to predict faculty’s intention to use learning management systems in the context of higher education (Figure 1).

2.2 Perceived usefulness

Perceived usefulness suggests that the performance of an individual enhances by using a specific system (Herrenkind et al., 2019). According to Davis (1989), task performance, effectiveness, and productivity are related to perceived usefulness. It is one of the major predictors of usage intention (Gefen et al., 2003; Gefen & Straub, 2004; Hsu & Lu, 2004). Several past studies have revealed that the usefulness of the technology has a significant impact on the adoption of technology (Chayomchai, 2020; Prasetyo et al., 2021). Wang et al. (2020) argued that the usefulness of technology increases the probability of technology acceptance. A recent study conducted by Fauzi et al. (2021) on the adoption of Google Classroom indicated the importance of technology during the COVID-19 pandemic. Therefore, the usability of online
technologies cannot be ignored while discussing online learning (Saadé, 2007). Therefore, we propose that:

H1. Perceived usefulness of learning management system will positively affect faculty members’ intention to use learning management system.

2.3 | Perceived ease of use

Perceived ease of use has a considerable worth in the TAM (Davis, 1989; Davis et al., 1992; Mathieson, 1991). The user interface has prime importance in technology-oriented products. Past studies depict that the authors have paid much focus on the technology ease of use as it facilitates the use of technology (Chin, 1999; Davis et al., 1989; Davis & Venkatesh, 1996). Özdemir (2020) suggested that teacher effectiveness in online teaching increases through proper understanding regarding the use of new technologies. Raza et al’s (2021) study on the acceptance of learning management system during COVID-19 pandemic in developing countries revealed faculty members’ low tendency towards technology. Similarly, Prasetyo et al. (2021) conducted a study on the adoption of E-learning technology during COVID-19 pandemic highlighting the importance of technology ease of use. In line with this, the study of Hong et al. (2021) during COVID-19 depicts the importance of perceived ease of use on the adoption of educational technology. The above discussion provides ample evidence related to the effectiveness and impact of perceived ease of use on the perceived usefulness of learning management system as a tool to assist faculty members to deliver the lectures. Therefore, we propose that:

H2. Perceived ease of learning management system program will positively affect perceived usefulness of learning management system.

H3. Perceived ease of learning management system will positively affect faculty members’ intention to use learning management system.

2.4 | User-interface design

The user-centered interface design has gained much importance in the research (McKnight et al., 1996). The software quality can be judged with the help of an interesting user interface design. A cluttered interface causes distraction and it becomes difficult to use. A user can navigate fast and easily on an inspiring interface (Jones et al., 1995; Martin-Michiellot & Mendelsohn, 2000). Gestalt theory played a useful role in the development of the guiding principles for website design. Leflore (2000) recommends that a clear message should be presented to the students. He further added that this can be possible by the systematic arrangement of the information. Students can be supported by delivering them an interactive interface (Evans & Edwards, 1999; Najjar, 1996). Liu et al. (2006) suggested that easy to navigate interface is the best system for students. They can easily navigate through panels and find desired information quickly. Furthermore, authors have presented rules to create and maintain a smooth interface, that is: 1) segregation of important information, 2) order information as per user, 3) present the big picture, 4) consistency in the links and buttons, 5) feedback system. These rules have received a warm welcome and had been applied in various settings (Cutri & Whiting, 2018; Loh et al., 2007). Therefore, we propose that:

H4. User-interface design of learning management system will positively affect the perceived usefulness of learning management system.

H5. User-interface design of learning management system will positively affect the perceived ease of use of learning management system.

2.5 | Facilitating conditions (FC)

Facilitating conditions are the factors that create ease or difficulty while using technology. They can be referred to as the enablers or the barriers (Ngai et al., 2007). Venkatesh and Bala (2008) suggested that the facilitating conditions are control beliefs of an individual while using the technology. The availability of the infrastructure and devices
to use technology can be related to online learning (Keengwe & Kidd, 2010). The use of technology is highly dependent on the FC (Pajo & Wallace, 2001; Panda & Mishra, 2007; Teo, 2010). The faculty members and the students are the prime users of such interfaces. The involvement of faculty members increases with the availability of proper equipment (Teo, 2010; Teo et al., 2008). The successful implementation of online learning requires thorough training of the faculty members involved in the online teaching and learning process (Grant & Thornton, 2007; Keeler & Horney, 2007; Keengwe & Kidd, 2010; McQuiggan, 2007). A move from traditional to online learning is a major shift and FC can prove to be a motivational force in making this transition smooth and fruitful (Johnson, 2008; Maguire, 2005; Nelson & Thompson, 2005; Panda & Mishra, 2007). With respect to the usage of LMS, the researchers revealed that the FC has a direct and indirect impact on learning intention. However, the findings of Fatheha et al. (2015) showed an insignificant impact of FC on perceived ease of use. Another study conducted on individuals’ acceptance of e-government facilities revealed the insignificant effect of FC on intention to use e-government services (Susanto & Aljoza, 2015). Due to past studies contradicting findings, it is essential to further explore the effects of FC on intention to use technology from a developing country’s perspective. Therefore, we propose that:

H6. Facilitating conditions of learning management system will positively affect user-interface design.

H7. Facilitating conditions of learning management system will positively affect faculty members’ innovativeness.

H8. Facilitating conditions of learning management system will positively affect perceived ease of use of online teaching program.

2.6 | Innovativeness

Midgley and Dowling (1978) defined innovativeness as an independent construct that is referred to as an individual’s tendency to seek creativity and make innovation. Innovative people have the characteristic of novelty seeking that helps them to acquire plenty of information regarding new things (Hameed & Irfan, 2019) and influence their adoption of new technology (Goldsmith, 2001). The study of Hirschman (1980) refers to innovativeness as a personality trait that is reflected through novelty seeking. Bigné-Alcañiz et al. (2008) found the positive influence of innovativeness on perceived ease of use. Pajo and Wallace (2001) argued that successful online teaching not only depends on the availability of required technology but also on how teachers accept and use it. Several researchers have studied innovativeness in different domains; such as innovativeness for online shopping (Blake et al., 2003; Citrin et al., 2000; Goldsmith, 2001) and the adoption of new information technology (Agarwal & Karahanna, 2000). In particular, the study of Agarwal and Prasad (1998) proposed the concept of innovativeness in the domain of information technology, and defined it as “the willingness of an individual to try out any new information technology.” Subsequently, scholars have empirically verified the concept of innovativeness in the domain of information technology such as product acquisition through the World Wide Web (Citrin et al., 2000; Donthu & Garcia, 1999; Goldsmith, 2001) and future online purchase intention (Crespo & del Bosque, 2008; Goldsmith, 2001).

Loogma et al. (2012) explored the e-learning of vocational education teachers and found the potential gap of teachers’ use of e-learning tools. Similarly, Olortegi (2011) found that teachers are rigid to accept modern techniques that include internet resources in the classroom and the use of computers. Recently, Pittalis (2020) found the weak effect of personal innovativeness on perceived ease of use and pedagogical-learning for teachers intention to use Dynamic Geometry Software in geometry teaching. Prior studies provide ample support to the effectiveness of innovativeness on a person’s perceived ease of use and adoption of new technology. Hence, we hypothesized that:

H9. Faculty members’ innovativeness will positively affect perceived ease of using learning management system.

H10. Faculty members’ innovativeness will positively affect faculty members’ intention to use learning management system.

3 | METHODOLOGY

3.1 | Sampling

The participants of this study are university faculty members from all over Pakistan. Owing to COVID-19 restrictions, in-campus activities were suspended in Pakistani universities, therefore, we decided to collect online data and assess faculty members’ intention to use LMS. Convenience sampling technique was employed to collect the data from the faculty members. The samples include large and medium-sized universities of Islamabad, Lahore, Karachi, Quetta, and Turbat. These selected regions represent more than 70% of large and medium-sized universities listed in Pakistan. The collection of data from large and medium-sized universities will have more representation. The email addresses of faculty members were taken from universities’ websites. The questionnaire along with a cover letter was sent to the faculty members of the universities. The cover letter mentioned the purpose of the study and ensured the confidentiality of the participants (Appendix). The sample size for this study was determined by following the guidelines of Hair et al. (2010). They suggested a ratio of 5 to 10 responses per item. Given the total number of 24 items, a sample size of 240 was appropriate. A total of 510 questionnaires were sent to the faculty members in Pakistan to increase the reliability of data. Initially, we received a very low response rate. Then we sent two reminder emails and requested the faculty members to participate in the survey. In the end, we received 292 valid responses with a response rate of 57.25%. Lusk et al. (2007) found that online survey yields only 9% response rate. Likewise, Aerny-Perreten
et al. (2015) stated that the response rate of around 50% is considered good in the online survey.

3.2 | Instrument

A pilot test of the questionnaire was conducted on 45 faculty members. After making compulsory changes in the layout and language of the questionnaire, it was then sent to three academic experts for further evaluation. The questionnaire consisted of two parts: the first part was related to the demographic profile of university faculty. The second part consisted of the items of the variables. A five-point Likert scale was used that ranged from strongly disagree (1) to strongly agree (5). All the measurements items were adapted from past studies. Fathema et al. (2015) and Hung et al.’s (2006) measurement items were used for the adaptation of the scale of the facilitating conditions. Innovativeness items were adapted from the study of Manning et al. (1995). Perceived usefulness and perceived ease of use items were adapted from the study of Liu et al. (2010). User-interface design was measured from the items adapted from the study of Liu et al. (2010). Faculty members’ intention to use LMS technology for teaching scale was adapted from the study of Hung et al. (2006) and Liu et al. (2010).

3.3 | Faculty’ profile

As regards to demographic characteristics of the faculty members, the majority of them were male (\(n = 152\)). In terms of academic qualification, the majority of the faculty members hold MPhil degrees (\(n = 146\)). In terms of faculty members’ ages, the majority of them belong to the age category of 31 to 35 years (\(n = 190\)). In terms of marital status, the majority of the faculty members were married (\(n = 199\)). In terms of teaching experience, the majority of the faculty members had 6 to 10 years of teaching experience at higher education institutions (\(n = 166\)).

4 | DATA ANALYSIS

4.1 | The measurement model

The measurement model of this study was assessed by using the partial least squares structural equation modeling (PLS-SEM). PLS have several advantages over other statistical techniques such as it is applicable to small sample size, suitable for prediction, avoid factor indeterminacy, and does not require data normality (Fornell & Bookstein, 1982). A two-steps analytical method was used in this study. First, we assessed the measurement model, secondly, we tested the structural model. Table 1 is showing the measurement model depicting factor loadings of the items, reliability values, and convergent validity. Hair et al. (2014) and Nunnally and Bernstein (1994) argued that the values of composite reliability (CR) must be greater than 0.70 and the values of average variance extracted (AVE) must be greater than 0.50 for convergent validity. Table 1 showing CR value ranges 0.803 to 0.865 and AVE value ranges 0.507 to 0.595 are above the recommended threshold, thus confirming the presence of convergent validity. We have followed Fornell and Larcker’s (1981) criterion to assess the extent to which a construct is unrelated to other constructs. Table 2 is showing discriminant validity values as per Fornell and Larcker's (1981) criterion. Discriminant validity establishes when the values of the square root of AVEs are greater than the construct’s correlations. In this study discriminant validity is confirmed as the values of all constructs AVEs are greater than correlation among the constructs (Farrell, 2010).

4.2 | The structural model

For the assessment of the structural model and predictive power of the model, the study evaluated the path coefficients, predictive relevance (\(Q^2\)), and coefficient of determination (\(R^2\)). Bootstrapping of 2000 resample method has been applied for the analysis of proposed hypotheses. The path values closer to ±1 indicates a strong relationship and vice versa. The \(R^2\) value was assessed to estimate the variance explained by the exogenous constructs on the endogenous construct (faculty members’ intention to use LMS). In this study, 40.5% variance was explained by the endogenous constructs on faculty members’ intention to use LMS. It shows moderate to high predictive accuracy of the extended TAM model. Further, the study used cross-redundancy value (\(Q^2\)) to determine the predictive relevance of the model. The \(Q^2\) values for endogenous constructs should be greater than 0 for the predictive relevance of the model. The \(Q^2\) value for perceived usefulness, innovativeness, perceived ease of use, intention to use LMS and user-interface design are 0.047, 0.062, 0.099, 0.222, and 0.263, respectively, which is greater than 0 and represents moderate predictive relevance of the proposed model (Hair et al., 2016).

The results of the structural model and hypotheses analysis are shown in Table 3. The acceptance and rejection of theoretical relationships are based on the path coefficients and significance values. The results of this study show that out of 10 hypotheses nine were accepted. H1 proposed the positive effect of perceived usefulness using learning management system on faculty members’ intention to use learning management system was accepted (\(\beta = 0.208, t = 5.341, p < 0.000\)). H2 proposed the positive effect of perceived ease of using learning management system on perceived usefulness of learning management system was accepted (\(\beta = 0.184, t = 2.853, p < 0.004\)). H3 proposed positive effect of perceived ease using learning management system on faculty members’ intention to use learning management system was accepted (\(\beta = 0.262, t = 5.341, p < 0.000\)). H4 proposed the positive effect of user-interface design on perceived ease of using learning management system was accepted (\(\beta = 0.282, t = 3.988, p < 0.000\)). H5 proposed positive effect of user-interface design on perceived usefulness using learning management system was accepted (\(\beta = 0.208, t = 3.593, p < 0.000\)). H6 proposed the positive effect of facilitating conditions on user-interface design was highly significant and accepted (\(\beta = 0.693, t = 25.287, p < 0.000\)).
proposed positive effect of facilitating conditions on faculty members innovativeness was accepted ($\beta = 0.345$, $t = 6.164$, $p < 0.000$). H8 proposed positive effects of facilitating conditions on perceived ease of using learning management system was rejected ($\beta = 0.037$, $t = 0.469$, $p < 0.639$). H9 proposed positive effect of faculty innovativeness on perceived ease of using learning management system was accepted ($\beta = 0.249$, $t = 3.921$, $p < 0.000$). H10 proposed the positive effect of faculty innovativeness on intention to use learning management system was also accepted ($\beta = 0.418$, $t = 7.597$, $p < 0.000$) (Figure 2).

### TABLE 1 The measurement model

| Constructs               | Items       | Standardized factor loading | Cronbach’s alpha ($\alpha$) | Convergent validity |
|--------------------------|-------------|----------------------------|-----------------------------|---------------------|
|                          |             |                            |                             | Composite reliability (CR) | Average variance extracted (AVE) |
| Intention to use         | INT1        | 0.739                      | 0.774                       | 0.855               | 0.595               |
|                          | INT2        | 0.797                      |                             |                     |
|                          | INT3        | 0.791                      |                             |                     |
|                          | INT4        | 0.757                      |                             |                     |
| User-interface design    | UID1        | 0.834                      |                             |                     |
|                          | UID2        | 0.828                      | 0.633                       | 0.803               | 0.581               |
|                          | UID3        | 0.601                      |                             |                     |
| Facilitating conditions  | FC1         | 0.796                      |                             |                     |
|                          | FC2         | 0.654                      | 0.735                       | 0.827               | 0.546               |
|                          | FC3         | 0.740                      |                             |                     |
|                          | FC4         | 0.758                      |                             |                     |
| Perceived usefulness     | PU1         | 0.720                      |                             |                     |
|                          | PU2         | 0.727                      | 0.676                       | 0.803               | 0.507               |
|                          | PU3         | 0.784                      |                             |                     |
|                          | PU4         | 0.607                      |                             |                     |
| Perceived ease of use    | PEO1        | 0.627                      |                             |                     |
|                          | PEO2        | 0.766                      | 0.701                       | 0.815               | 0.526               |
|                          | PEO3        | 0.756                      |                             |                     |
|                          | PEO4        | 0.742                      |                             |                     |
| Innovativeness           | INV1        | 0.731                      |                             |                     |
|                          | INV2        | 0.769                      |                             |                     |
|                          | INV3        | 0.802                      | 0.805                       | 0.865               | 0.564               |
|                          | INV4        | 0.784                      |                             |                     |
|                          | INV5        | 0.659                      |                             |                     |

Abbreviations: FC, facilitating conditions; INT, intention to adopt; INV, innovativeness; PEO, perceived ease of use; PU, perceived usefulness; UID, user-interface design.

### TABLE 2 Discriminant validity

| Latent variables               | 1   | 2   | 3   | 4   | 5   | 6   |
|--------------------------------|-----|-----|-----|-----|-----|-----|
| Facilitating conditions        | 0.739 |     |     |     |     |     |
| Innovativeness                 | 0.345 | 0.751 |     |     |     |     |
| Intention                      | 0.329 | 0.569 | 0.772 |     |     |     |
| Perceived ease of use          | 0.318 | 0.347 | 0.442 | 0.725 |     |     |
| Perceived usefulness           | 0.336 | 0.465 | 0.393 | 0.264 | 0.712 |     |
| User-interface design          | 0.693 | 0.302 | 0.300 | 0.382 | 0.279 | 0.762 |

Note: The diagonals (in bolds) represent the square root of AVE, and off-diagonal values represent the correlations of each construct with other constructs.

### 5 CONCLUSION AND DISCUSSIONS

This study attempted to extend Technology Acceptance Model (TAM) to predict faculty members’ intention to use learning management system during the COVID-19 pandemic. The extended TAM model included three novel constructs such as faculty members’ innovativeness, facilitating conditions and user-interface designs, which are crucial predictors of acceptance of technology. The findings of the study are encouraging, and the majority of the results are highly
significant and accepted. This study is consistent with Davis’s (1989) TAM model where the researchers found the effectiveness of the model predicting behavioral intention. Past studies, in the context of online education, revealed the effectiveness of TAM in the adoption of technology (Landry et al., 2006; Lee et al., 2005; Ngai et al., 2007). This study covers a new dimension that focuses on higher education faculty members’ innovativeness trait towards the use of LMS technology in teaching.

In terms of the positive influence of perceived usefulness of LMS, the results reveal a positive effect of perceived usefulness on faculty intention to use LMS technology in teaching. The findings are consistent with previous researches in the domain of technology acceptance (Briz & Garcia, 2015; Hsu & Lu, 2004; Davis, 1989). This depicts that faculty members in universities consider LMS as a viable option. In terms of the positive effect of perceived ease of using LMS on perceived usefulness of LMS, the results reveal a positive effect of perceived ease of use on perceived usefulness of LMS; the findings are consistent with the existing studies (Davis, 1989; Gefen et al., 2003; Gefen & Straub, 2004; Tan et al., 2012). It shows that faculty members feel of ease of using LMS is useful in their teaching methodology.

In terms of the positive relationship between perceived ease of using LMS and intention to use, the findings reveal that perceived ease of using LMS has a significant effect on faculty’s intention to use LMS. Prior researchers have found similar results regarding the effectiveness of perceived ease of use on intention to use LMS in a developing country’s perspective (Raza et al., 2021). The more the faculty members feel

| Table 3 | Hypotheses assessment summary |
|---------|-------------------------------|
|         | Hypotheses | Beta  | SE   | p-values | t-values | Decision | Interpretation |
|         | PU → INT   | 0.129 | 0.060| 0.033*   | 2.138    | Accepted  | Small        |
|         | PEO → PU   | 0.184 | 0.065| 0.004**  | 2.853    | Accepted  | Small        |
|         | PEO → INT  | 0.262 | 0.049| 0.000*** | 5.341    | Accepted  | Large        |
|         | UID → PEO  | 0.282 | 0.071| 0.000*** | 3.988    | Accepted  | Small        |
|         | UID → PU   | 0.208 | 0.058| 0.000*** | 3.593    | Accepted  | Small        |
|         | FC → UID   | 0.693 | 0.027| 0.000*** | 25.287   | Accepted  | Large        |
|         | FC → INV   | 0.345 | 0.056| 0.000*** | 6.164    | Accepted  | Large        |
|         | FC → PEO   | 0.037 | 0.078| 0.639    | 0.469    | Rejected  | —            |
|         | INV → PEO  | 0.249 | 0.064| 0.000*** | 3.921    | Accepted  | Small        |
|         | INV → INT  | 0.418 | 0.055| 0.000*** | 7.597    | Accepted  | Large        |

***p < 0.001; **p < 0.01; *p < 0.05.

**Figure 2** Structural equation model
that they have the expertise to use LMS for teaching; they will be more inclined to use LMS as a medium of delivering lectures.

In terms of the positive effect of user-interface design on perceived ease of use, the result shows the positive relationship between user-interface design and faculty members’ intention to use LMS. The findings are consistent with previous researchers where authors argued that a better user interface helps to operate the system easily and reduces the workload (Jones et al., 1995; Martin-Michiellot & Mendelsohn, 2000). In terms of the positive effect of user-interface design on the perceived usefulness of LMS, the findings are consistent with previous studies where authors discussed the importance of a good user interface in online learning (Evans & Edwards, 1999; Najjar, 1996).

In terms of the positive effect of facilitating conditions on user-interface designs of the system, the findings show the positive influence of facilitating conditions on user-interface design. The results are consistent with previous research of Venkatesh and Bala (2008), where authors argued that the availability of required materials would improve technology efficiency. In terms of the positive influence of facilitating conditions on the innovativeness of faculty, the result shows a significant positive effect of facilitating conditions on the innovativeness of faculty to use LMS in teaching. Previous studies have shown that the effect of facilitating conditions such as professional development and training related to the usage of new technology helps faculty members to learn new skills (Grant & Thornton, 2007; Keeler & Horney, 2007; Keengwe & Kidd, 2010). In terms of the positive effect of facilitating conditions on perceived ease of using LMS, the results did not support the proposed hypothesis. Fathema et al. (2015) also found that FC has an insignificant impact on the perceived ease of using LMS in higher education. The insignificant influence can be attributed due to the lack of available resources in many of the universities of developing countries.

In terms of the positive effect of innovativeness on perceived ease of using LMS, the result depicts that the innovativeness trait of faculty members has a positive influence on perceived ease of using LMS. This signifies that innovative traits of faculty members help to learn and use LMS easily, and it matches with the findings of Rogers and Wallace (2011), where authors confirmed that teacher innovativeness leads to the acceptance of technology. In terms of the positive influence of innovativeness on intention to adopt online teaching, the results support previous findings where researchers argued that innovativeness leads to the adoption of new technology (Agarwal & Karahanna, 2000; Agarwal & Prasad, 1998; Goldsmith, 2001).

5.1 Policy implications

To understand faculty members’ intention to use learning management system, this study constructed an extended TAM model that includes faculty members’ innovativeness, facilitating conditions and user-interface design. The addition of faculty members’ innovativeness traits user-interface designs and facilitating conditions are important in the context of higher education during COVID-19 pandemic. The spread of contagious coronavirus has affected the lives of people in more than 130 countries across the globe. In this regard, learning management system plays a vital role to compensate for the student’s educational loss. Therefore, it is first necessary to evaluate faculty members’ tendency to use LMS technology.

The finding of the study offers guidance to practitioners and educators in understanding faculty members’ intention to use LMS technology. First, the results of the study provide insight to university leaders and educationists to provide all materials and staff support required for the proper delivery of online lectures (Mishra et al., 2020). Second, the universities should arrange training facilities for the faculty members to promote teaching through learning management system and ensure the proper delivery of lectures and materials on a timely basis (Bao, 2020). Third, a user-friendly interface is the ultimate need of the time for maintaining faculty members’ interest in the use of technology as poor interface design may interrupt teachers’ communication with the student. Finally, the innovative trait of a faculty member is one of the most essential aspects of using new technology such as LMS in a developing country perspective.

Faculty members of a developing country have a low tendency towards technology-based teaching, therefore they prefer the traditional method of teaching (Raza et al., 2021). Often neglected but most important aspect of distance education is the innovativeness of faculty members to use new technology smoothly. With the advancement in teaching methodology, innovativeness has a crucial part to play in this regard. Less innovative faculty members are reluctant to adapt to new technology leading to distortion in communication and poor delivery of lectures. Therefore, innovativeness has a vital role in the adoption of technology. Innovativeness traits of faculty can be improved through professional training and development programs. Last but not least, the two factors of TAM model such as perceived usefulness and perceived ease of use of learning management system can be gauged from the fact that it offers distance teaching facilities to the students in any corner of the world. The usefulness of LMS technology provides opportunities for faculty members and students to share knowledge and connect. The perceived ease of use depends upon the faculty skills, innovativeness, and adaptation of new technology that can be improved through training and development of faculty.

5.2 Limitations and future research directions

This study has some limitations. The first limitation is related to the methodology of the study. Data of the faculty members were collected through an online survey and convenience sampling technique. Future researchers can collect data through face-to-face survey techniques in order to ensure faculty engagement with the research. The second limitation is related to the respondents of the study. This study has only considered faculty members of higher education institutes with higher homogeneity, therefore generalization cannot be done to all levels in Pakistan, future researches can be conducted by including faculty members from all hierarchies of the education system. Third, this study has adopted a self-reported approach and included subjective measures. Future studies may consider some objective parameters to conclude such as assessing faculty learning
management system, numbers of teaching hours and online teaching score from the database. Then, researchers will be able to track the teachers’ online teaching effectiveness from a different perspective.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

DATA AVAILABILITY STATEMENT

Data available on request from the authors.

ORCID

Irfan Hameed https://orcid.org/0000-0002-1484-6133

REFERENCES

Aerny-Perreten, N., Dominguez-Berjón, M. F., Esteban-Vasallo, M. D., & García-Riolobos, C. (2015). Participation and factors associated with late or non-response to an online survey in primary care. *Journal of Evaluation in Clinical Practice, 21*(4), 688–693.

Agarwal, R., & Karahanna, E. (2000). Time flies when you’re having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly, 24*, 665–694.

Agarwal, R., & Prasad, J. (1998). A conceptual and operational definition of innovative technology in teaching in Yemeni schools. *Information Systems Research, 9*(2), 204–215.

Ahorsu, D. K., Lin, C. Y., Imani, V., Safavi, M., Griffiths, M. D., & Pakpour, A. H. (2020). The fear of COVID-19 scale: Development and initial validation. *International Journal of Mental Health and Addiction, 1–9.*

Alias, N. A., & Zainuddin, A. M. (2005). Innovation for better teaching and learning: Adopting the learning management system. *Malaysian Online Journal of Instructional Technology, 2*(2), 27–40.

Al-Mamary, Y. H. S. (2020). Examining the factors affecting the use of ICT in teaching in Yemeni schools. *Journal of Public Affairs, 22*(01), 1–13.

Anderson, R. M., Heesterbeek, H., Klinkenberg, D., & Hollingsworth, T. D. (2020). How will country-based mitigation measures influence the course of the COVID-19 epidemic? The *Lancet, 393*(10228), 931–934.

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies, 2*(2), 113–115.

Bigné-Alcalíz, E., Ruiz-Mafé, C., Aldás-Manzano, J., & Sanz-Blas, S. (2008). Influence of online shopping information dependency and innovativeness on internet shopping adoption. *Online Information Review, 32*(5), 648–667.

Blake, B. F., Neuendorf, K. A., & Valdiserri, C. M. (2003). Innovativeness and variety of Internet shopping. *Internet Research, 13*(3), 156–169.

Briz-Ponce, L., & García-Peñalvo, F. J. (2015). An empirical assessment of a technology acceptance model for apps in medical education. *Journal of Medical Systems, 39*(11), 1–5.

Chayomchai, A. (2020). The online technology acceptance model of generation-Z people in Thailand during COVID-19 crisis. *Management & Marketing, 15*, 496–512.

Chin, K. L. (1999). A study into students’ perceptions of web-based learning environment. In *HERDSA Annual International Conference* (pp. 12–15), Melbourne, Australia.

Citrin, A. V., Sprott, D. E., Silverman Steven, N., Donald, E., Jr., & Stern, J. (2000). Adoption of Internet shopping: The role of consumer innovativeness. *Industrial Management and Data Systems, 100*(7), 294–3000.

Crespo, Á. H., & del Bosque, I. R. (2008). The effect of innovativeness on the adoption of B2C e-commerce: A model based on the theory of planned behaviour. *Computers in Human Behavior, 24*(6), 2830–2847.

Cutri, R. M., & Whiting, E. F. (2018). Opening spaces for teacher educator knowledge in a faculty development program on blended learning course development. *Studying Teacher Education, 14*(2), 125–140.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*, 319–339.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*(14), 1111–1132.

Davis, F. D., & Venkatesh, V. (1996). A critical assessment of potential measurement biases in the technology acceptance model: Three experiments. *International Journal of Human-Computer Studies, 45*(1), 19–45.

Dede, C. (1996). The evolution of distance education: Emerging technologies and distributed learning. *American Journal of Distance Education, 10*(2), 4–36.

Donthu, N., & Garcia, A. (1999). The internet shopper. *Journal of Advertising Research, 39*(3), 52.

Dunn, M., & Rice, M. (2019). Community, towards dialogue: A self-study of online teacher preparation for special education. *Studying Teacher Education, 15*(2), 160–178.

Evans, C., & Edwards, M. (1999). Navigational interface design for multimedia courseware. *Journal of Educational Multimedia and Hypermedia, 8*(2), 151–174.

Farrell, A. M. (2010). Insufficient discriminant validity: A comment on Bove, Pervan, Beatty, and Shiu (2009). *Journal of Business Research, 63*, 324–327.

Fatetha, N., Shannon, D., & Ross, M. (2015). Expanding the technology acceptance model (TAM) to examine faculty use of learning management systems (LMSs) in higher education institutions. *Journal of Online Learning & Teaching, 11*(2), 210–232.

Fauzi, A., Wandira, R., Sepri, D., & Hafid, A. (2021). Exploring Students’ acceptance of Google classroom during the Covid-19 pandemic by using the technology acceptance model in west Sumatera universities. *Electronic Journal of e-Learning, 19*(4), pp233–pp240.

Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research, 19*(4), 440–452.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50.

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly, 27*(1), 51–90.

Gefen, D., & Straub, D. W. (2004). Consumer trust in B2C e-commerce and the importance of social presence: Experiments in e-products and e-services. *Omega, 32*(6), 407–424.

Goldsmith, R. E. (2001). Using the domain specific innovativeness scale to identify innovative internet consumers. *Internet Research, 11*(2), 149–158.

Grant, M. R., & Thornton, H. R. (2007). Best practices in undergraduate adult-centered online learning: Mechanisms for course design and delivery. *Journal of Online Learning and Teaching, 3*(4), 346–356.

Hair, J., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate data analysis*. Pearson Education.

Hair, J., Sarstedt, M., Hopkins, L., & Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool in business research. *European Business Review, 26*(2), 106–121.

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.

Hameed, I., & Irfan, B. Z. (2021). Social media self-control failure leading to antisocial aggressive behavior. *Human Behavior and Emerging Technologies, 3*(2), 296–303.

Hameed, I., & Irfan, Z. (2019). Entrepreneurship education: A review of challenges, characteristics and opportunities. *Entrepreneurship Education, 2*(3), 135–148.
Harrison, R. A., Harrison, A., Robinson, C., & Rawlings, B. (2018). The experience of international postgraduate students on a distance-learning programme. *Distance Education*, 39(4), 480–494.

Herrenkind, B., Brendel, A. B., Naastjuk, I., Greve, M., & Kolbe, L. M. (2019). Investigating end-user acceptance of autonomous electric buses to accelerate diffusion. *Transportation Research Part D: Transport and Environment*, 74, 255–276.

Hirschman, E. C. (1980). Innovativeness, novelty seeking, and consumer creativity. *Journal of Consumer Research*, 7(3), 283–295.

Hong, X., Zhang, M., & Liu, Q. (2021). Preschool Teachers’ Technology acceptance during the COVID-19: An adapted technology acceptance model. *Frontiers in Psychology*, 12, 691492.

Hsu, C. L., & Lu, H. P. (2004). Why do people play on-line games? An extended TAM with social influences and flow experience. *Information & Management*, 41(7), 853–868.

Hun, S. Y., Chang, C. M., & Yu, T. J. (2006). Determinants of user acceptance of the e-government services: The case of online tax filing and payment system. *Government Information Quarterly*, 23(1), 97–122.

Jaschik, S., Lederman, D., & Gallup, C. (2014). Faculty attitudes on technology. Inside Higher Education.

Johnson, A. (2008). A nursing faculty’s transition to teaching online.

Jaschik, S., Lederman, D., & Gallup, C. (2014). Faculty attitudes on technology. Inside Higher Education.

Jones, M. G., Farquhar, J. D., & Surry, D. W. (1995). Using metacognitive

Johnson, A. (2008). A nursing faculty’s transition to teaching online.

Jaschik, S., Lederman, D., & Gallup, C. (2014). Faculty attitudes on technology. Inside Higher Education.

Hung, S. Y., Chang, C. M., & Yu, T. J. (2006). Determinants of user acceptance of the e-government services: The case of online tax filing and payment system. *Government Information Quarterly*, 23(1), 97–122.

Jaschik, S., Lederman, D., & Gallup, C. (2014). Faculty attitudes on technology. Inside Higher Education.

Jones, M. G., Farquhar, J. D., & Surry, D. W. (1995). Using metacognitive theories to design user interfaces for computer-based learning. *Educational Technology*, 35(4), 12–22.

Kalloo, R. C., Mitchell, B., & Kamalodeen, V. J. (2020). Responding to the COVID-19 pandemic in Trinidad and Tobago: Challenges and opportunities for teacher education. *Journal of Education for Teaching*, 46(4), 452–462.

Kaufmann, R., & Buckner, M. M. (2019). Revisiting “power in the classroom”: Exploring online learning and motivation to study course content. *Interactive Learning Environments*, 27(3), 402–409.

Keeler, C., & Horney, M. (2007). Online course designs: Are special needs being met. *The American Journal of Distance Education*, 21(2), 65–75.

Keengwe, J., & Kidd, T. T. (2010). Towards best practices in online learning and teaching in higher education. *MERLOT Journal of Online Learning and Teaching*, 6(2), 533–541.

Landry, B. J., Griffeth, R., & Hartman, S. (2006). Measuring student perceptions of blackboard using the technology acceptance model. *Decision Sciences Journal of Innovative Education*, 4(1), 87–99.

Lee, M. K., Cheung, C. M., & Chen, Z. (2005). Acceptance of internet-based learning medium: The role of extrinsic and intrinsic motivation. *Information & Management*, 42(8), 1095–1104.

Leflore, D. (2000). Theory supporting design guidelines for web-based instruction. Instructional and cognitive impacts of web-based education. Idea Group Publishing.

Liu, I. F., Chen, M. C., & Sun, Y. (2006). The design of a web-based learning platform: A case study in Taiwan. In Proceedings of the 14th International Conference on Computers in Education (ICCE2006), Beijing, China.

Liu, I. F., Chen, M. C., Sun, Y. S., Wible, D., & Kuo, C. H. (2010). Extending the TAM model to explore the factors that affect intention to use an online learning community. *Computers & Education*, 54(2), 600–610.

Lohr, L. L., Falro, D. A., Hunt, E., & Johnson, B. (2007). Improving the usability of distance learning through template modification. In *Flexible learning in an information society*. Idea Group Inc.

Loogma, K., Kruusvall, J., & Ümarik, M. (2012). E-learning as innovation: Exploring innovativeness of the VET teachers’ community in Estonia. *Computers & Education*, 58(2), 808–817.

Lusk, C., Delclos, G. L., Burau, K., Drawhorn, D. D., & Aday, L. A. (2007). Mail versus internet surveys: Determinants of method of response preferences among health professionals. *Evaluation & the Health Professions*, 30(2), 186–201.

Maguire, L. L. (2005). Literature review–faculty participation in online distance education: Barriers and motivators. *Online Journal of Distance Learning Administration*, 8(1), 1–16.

Manning, K. C., Bearden, W. O., & Madden, T. J. (1995). Consumer innovativeness and the adoption process. *Journal of Consumer Psychology*, 4(4), 329–345.

Martin-Michielot, S., & Mendelsohn, P. (2000). Cognitive load while learning with a graphical computer interface. *Journal of Computer Assisted Learning*, 16(4), 284–293.

Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research*, 2(3), 173–191.

McKnight, C., Dillon, A., & Richardson, J. (1996). User centered design of hypertext and hypermedia for education. Macmillan.

McQuiggan, C. A. (2007). The role of faculty development in online teaching’s potential to question teaching beliefs and assumptions. *Online Journal of Distance Learning Administration*, 10(3), 1–13.

Metros, S. E., & Hedberg, J. G. (2002). More than just a pretty (inter) face: The role of the graphical user interface in engaging learners. *Quarterly Review of Distance Education*, 3(2), 191–205.

Midgley, D. F., & Dowling, G. R. (1978). Innovativeness: The concept and its measurement. *Journal of Consumer Research*, 4(4), 229–242.

Mishra, L., Gupta, T., & Shree, A. (2020). Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *International Journal of Educational Research Open*, 1, 100012.

Murphy, M. S., & Pinnegar, S. (2018). Shaping community in online courses: A self-study of practice in course design to support the relational. Studying Teacher Education, 14(3), 272–283.

Najjar, L. J. (1996). Multimedia information and learning. *Journal of Educational Multimedia and Hypermedia*, 5(2), 129–150.

Nelson, S. J., & Thompson, G. W. (2005). Barriers perceived by administrators and faculty regarding the use of distance education technologies in pre-service programs for secondary agricultural education teachers. *Journal of Agricultural Education*, 46(4), 36–48.

Nga, E. W., Poon, J. K. L., & Chan, Y. H. (2007). Empirical examination of the adoption of WebCT using TAM. *Computers & Education*, 48(2), 250–267.

Nunnally, J. C., & Bernstein, I. H. (1994). Validity. Psychometric Theory, 3, 99–132.

Oloruntobegbe, K. O. (2011). Teachers’ involvement, commitment and innovativeness in curriculum development and implementation. *Journal of Emerging Trends in Educational Research and Policy Studies*, 2(6), 443–449.

Ong, C. S., Lai, J. Y., & Wang, Y. S. (2004). Factors affecting engineers’ acceptance of asynchronous e-learning systems in high-tech companies. *Information & Management*, 41(6), 795–804.

Oyarzun, B., Martin, F., & Moore, R. L. (2020). Time management matters: Online faculty perceptions of helpfulness of time management strategies. *Distance Education*, 41(1), 106–127.

Özdemir, N. (2020). How to improve teachers’ instructional practices: The role of professional learning activities, classroom observation and leadership content knowledge in Turkey. *Journal of Educational Administration*, 58, 585–603. [https://doi.org/10.1108/JEA-10-2019-0189]

Paja, K., & Wallace, C. (2001). Barriers to the uptake of web-based technology by university teachers. The *Journal of Distance Education*, 14(1), 70–84.

Panda, S., & Mishra, S. (2007). E-learning in a mega Open University: Faculty attitude, barriers and motivators. *Educational Media International*, 44(4), 323–338.

Park, E., Lim, J., & Cho, Y. (2018). Understanding the emergence and social acceptance of electric vehicles as next-generation models for the automobile industry. *Sustainability*, 10(3), 662.

Pittalakis, M. (2020). Extending the technology acceptance model to evaluate teachers’ intention to use dynamic geometry software in geometry teaching. *International Journal of Mathematical Education in Science and Technology*, 52(9), 1385–1404.

Ptuch, K. A., & Lee, Y. K. (2006). The influence of system characteristics on e-learning use. *Computers & Education*, 47(2), 222–244.

Prasetyo, Y. T., Ong, A. K. S., Concepcion, G. K. F., Navata, F. M. B., Robles, R. A. V., Tomagos, I. J. T., Young, M. N., Diaz, J. F. T., Nadlifatin, R., & Redi, A. A. N. P. (2021). Determining factors affecting
acceptance of E-learning platforms during the COVID-19 pandemic: Integrating extended technology acceptance model and DeLone & McLean IS success model. Sustainability, 13(1), 8365.

Rachmadulliah, R., Marianus Subandowo, R., Humaira, M. A., Aliyah, R. R., Samsudin, A., & Nurtanto, M. (2020). Use of blended learning with moodle: Study effectiveness in elementary school teacher education students during the COVID-19 pandemic. International Journal of Advanced Science and Technology, 29(7), 3272–3277.

Raza, S. A., Khan, K. A., & Rafi, S. T. (2020). Online education & MOOCs: Teacher self-disclosure in online education and a mediating role of social presence. South Asian Journal of Management, 1(4), 142–158.

Raza, S. A., Qazi, W., Khan, K. A., & Salam, J. (2021). Social isolation and acceptance of the learning management system (LMS) in the time of COVID-19 pandemic: An expansion of the UTAUT model. Journal of Educational Computing Research, 59(2), 183–208.

Roberts, J. (2018). Future and changing roles of staff in distance education: A study to identify training and professional development needs. Distance Education, 39(1), 37–53.

Rogers, R. K., & Wallace, J. D. (2011). Predictors of technology integration in education: A study of anxiety and innovativeness in teacher preparation. Journal of Literacy & Technology, 12(2), 28–61.

Saadé, R. G. (2007). Dimensions of perceived usefulness: Toward enhanced assessment. Decision Sciences Journal of Innovative Education, 5(2), 289–310.

Shah, S. N. A., Khan, A. U., Khan, B. U., Khan, T., & Xuehe, Z. (2021). Framework for teachers’ acceptance of information and communication technology in Pakistan: Application of the extended UTAUT model. Journal of Public Affairs, 21(1), e2090.

Susanto, T. D., & Aljoza, M. (2015). Individual acceptance of e-government services in a developing country: Dimensions of perceived usefulness and perceived ease of use and the importance of trust and social influence. Procedia Computer Science, 72, 622–629.

Tan, G. W. H., Ooi, K. B., Sim, J. J., & Phusavat, K. (2012). Determinants of mobile learning adoption: An empirical analysis. Journal of Computer Information Systems, 52(3), 82–91.

Tandon, U. (2020). Factors influencing adoption of online teaching by school teachers: A study during COVID-19 pandemic. Journal of Public Affairs, 21(04), 1–11.

Teo, T. (2010). Examining the influence of subjective norm and facilitating conditions on the intention to use technology among pre-service teachers: A structural equation modeling of an extended technology acceptance model. Asia Pacific Education Review, 11(2), 253–262.

Teo, T. T., Lee, C. B., & Chai, C. S. (2008). Understanding pre-service teachers’ computer attitudes: Applying and extending the technology acceptance model. Journal of Computer Assisted Learning, 24(2), 128–143.

Teräs, M., Suoranta, J., Teräs, H., & Curcher, M. (2020). Post-Covid-19 education and education technology ‘solutionism’: A seller’s market. Postdigital Science and Education, 2(3), 863–878.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. Decision Sciences, 39(2), 273–315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management Science, 46(2), 186–204.

Waheed, M., Kaur, K., Ain, N., & Hussain, N. (2016). Perceived learning outcomes from Moodle: An empirical study of intrinsic and extrinsic motivating factors. Information Development, 32(4), 1001–1013.

Wang, C. J., Ng, C. Y., & Brook, R. H. (2020). Response to COVID-19 in Taiwan: Big data analytics, new technology, and proactive testing. JAMA, 323(14), 1341–1342.

Waris, I., Farooq, M., Hameed, I., & Shahab, A. (2021). Promoting sustainable ventures among university students in Pakistan: An empirical study based on the theory of planned behavior. On the Horizon, 29(1), 1–16.

Zwain, A. A. A. (2019). Technological innovativeness and information quality as neoteric predictors of users’ acceptance of learning management system: An expansion of UTAUT2. Interactive Technology and Smart Education, 16(3), 239–254.

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APPENDIX: THE QUESTIONNAIRE

Dear Respondent,

We are conducting a study on “Teaching through technology in higher education: An application of extended technology acceptance model (TAM).”

We need your help to best understand the higher education faculty members’ intention to use LMS technology during COVID19 pandemic.

The respondent will be kept anonymous. Your demographics will not be made available to anyone at any cost except authorized entities.

If you have any questions or concerns about the questionnaire or about participating in this study, you may contact me at idress1988@gmail.com.

Thanks for your cooperation,
Sincerely,
Dr. Idrees Waris
Assistant Professor, University of Turbat, Pakistan
&
Dr. Irfan Hameed

AUTHOR BIOGRAPHIES

Idrees Waris is an Assistant Professor in the Department of Management Sciences, University of Turbat, Pakistan. He holds PhD degree in Business Administration from Iqra University. His research mostly focuses on green entrepreneurship and consumer behavior. He has published research articles in reputable peer-reviewed journals including Social Responsibility Journal, International Journal of Environmental Research and Public Health, Energy Efficiency, Environmental Science and Pollution Research, and International Journal of Energy Sector Management, etc.

Irfan Hameed holds a PhD degree in marketing and serves as Head of Research at the Institute of Business Management, Karachi, Pakistan. He has been writing on sustainable issues for a long in the journals including British Food Journal, Review of Public Personnel Administration, International Small Business Journal, Journal of Marketing for Higher Education, Human Behavior and Emerging Technologies, Environment, Development and Sustainability, and Social Responsibility Journal, etc.
Associate Professor, Institute of Business Management Karachi, Pakistan

Teacher's gender: 1. Male; 2. Female.
Age: 1. 20 to 25 years; 2. 26 to 30 years; 3. 31 to 35 years; 4. 36 to 40 years; 5. More than 40 years.

Marital Status: 1. Married; 2. Unmarried.
Teaching experience: 1. 1 year to 5 years; 2. 6 years to 10 years; 3. More than 10 years.
Qualification: 1. Master degree; 2. MPhil degree; 3. Doctorate degree.

Please select your desired response:
Strongly disagree = 1
Disagree = 2
Neither Agree nor Disagree = 3
Agree = 4
Strongly Agree = 5
For example: If your response is strongly agree then it will be like this

| User-interface design | Strongly disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|-----------------------|-------------------|---------|---------------------------|-------|---------------|
| UID1                  | 1                 | 2       | 3                         | 4     | 5             |
| UID2                  | 1                 | 2       | 3                         | 4     | 5             |
| UID3                  | 1                 | 2       | 3                         | 4     | 5             |

| Innovativeness       | Strongly disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|----------------------|-------------------|---------|---------------------------|-------|---------------|
| INV1                 | 1                 | 2       | 3                         | 4     | 5             |
| INV2                 | 1                 | 2       | 3                         | 4     | 5             |
| INV3                 | 1                 | 2       | 3                         | 4     | 5             |
| INV4                 | 1                 | 2       | 3                         | 4     | 5             |
| INV5                 | 1                 | 2       | 3                         | 4     | 5             |

| Facilitating Conditions | Strongly disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|-------------------------|-------------------|---------|---------------------------|-------|---------------|
| FC1                     | 1                 | 2       | 3                         | 4     | 5             |
| FC2                     | 1                 | 2       | 3                         | 4     | 5             |
| FC3                     | 1                 | 2       | 3                         | 4     | 5             |
| FC4                     | 1                 | 2       | 3                         | 4     | 5             |

| Perceived Usefulness   | Strongly disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|------------------------|-------------------|---------|---------------------------|-------|---------------|
| PU1                    | 1                 | 2       | 3                         | 4     | 5             |
| PU2                    | 1                 | 2       | 3                         | 4     | 5             |
| PU3                    | 1                 | 2       | 3                         | 4     | 5             |
| PU4                    | 1                 | 2       | 3                         | 4     | 5             |

| Perceived Ease of Use  | Strongly disagree | Disagree | Neither Agree nor Disagree | Agree | Strongly Agree |
|------------------------|-------------------|---------|---------------------------|-------|---------------|
| PEO1                   | 1                 | 2       | 3                         | 4     | 5             |
| PEO2 | It is easy for me to do the things that I want to do by operating learning management system. | 1 | 2 | 3 | 4 | 5 |
|------|------------------------------------------------------------------------------------------|---|---|---|---|---|
| PEO3 | I feel learning management system is easy to handle when I encounter a problem.          | 1 | 2 | 3 | 4 | 5 |
| PEO4 | In general, I feel it is easy for me to use learning management system.                    | 1 | 2 | 3 | 4 | 5 |

### Intention to use LMS

| INT1 | I intend to use learning management system during COVID-19 pandemic.                      | 1 | 2 | 3 | 4 | 5 |
|------|------------------------------------------------------------------------------------------|---|---|---|---|---|
| INT2 | It is likely that I will use learning management system.                                  | 1 | 2 | 3 | 4 | 5 |
| INT3 | I expect to use learning management system to communicate with students.                  | 1 | 2 | 3 | 4 | 5 |
| INT4 | I will reuse learning management system for curriculum activities.                         | 1 | 2 | 3 | 4 | 5 |